Extraversion and Person-Environment Fit: Towards Consideration of Jungian Theory in Organizational Psychology

by

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Abstract

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Historically, the field of Industrial/Organizational (I/O) Psychology has relied on the Big 5 taxonomy of personality. The purpose of this study was to examine the value of a Jungian conception of extraversion in the context of the relationship between the physical work environment and person-environment (PE) fit. The MBTI and the NEO-IPIP, representing a Jungian and a taxonomic conception of personality, respectively, were hypothesized to predict the within-person relationship between extraverted environment and PE fit. PE fit was hypothesized to predict perceived satisfaction and perceived performance. To examine these hypotheses, 110 participants were recruited from Mturk and responded to 18 pictorial vignettes depicting workplace environments by indicating their perceived fit, perceived performance, and perceived satisfaction. Extraversion according to the MBTI positively predicted the within-person relationship between extraverted environment and PE fit, and PE fit positively predicted perceived performance and
perceived satisfaction. This study contributes to research and practice related to personality in organizations by demonstrating the potential value of Jungian theory to I/O psychology research, while also introducing how characteristics of the physical work environment may impact employee fit.
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Introduction

Within seconds of entering your office, Jim, your latest interviewee, has already made a good first impression. A firm handshake, relaxed eye contact, confident story telling; it is not hard to tell that this is an outgoing, confident applicant. As you show Jim the exit, you cannot help but acknowledge the gut feeling you have had for the last half hour: he would be a good fit with your organization. Extraversion, among other personality characteristics, is no stranger to Industrial/Organizational (I/O) psychology, as its ability to predict workplace outcomes has dominated this research domain for decades (Oswald & Hough, 2011; Salgado, 2003). Accordingly, as long as the job is highly interpersonal, Jim’s disposition is likely to put him at a performance advantage (Barrick & Mount, 1992; Barrick, Mount, & Judge, 2005). Yet, should personality’s practical application focus primarily on employee selection? We think not, and this study aims to demonstrate how an alternative conception of extraversion may shed light on how the design of the physical work environment and employee extraversion come together to influence employee fit and ultimately their performance and satisfaction.

Once merely psychology jargon, the term extraversion has surfaced as common vernacular used to describe outgoing behavior. As a scientific construct, however, its definition encompasses a wide span of personal characteristics. The extant literature on extraversion typically does not emphasize a distinction between operationalizations of this construct; yet a close inspection of personality
instruments reveals a divergence in how the measurement of extraversion originated, and thus how it has been conceptualized, with none more opposing than the Big 5 and the MBTI.

The predominant approach to personality measurement used in recent organizational research has been the Big 5. Formed on the basis of lexical factor analyses, the Big 5 was constructed by aggregating similar terms, eventually forming five factors, with extraversion being the first factor (Digman, 1990). Although several personality measures fall under the umbrella of the Big 5, such as the Big Five Inventory (John, Donahue & Kentle, 1991) and the Abridged Big Five Dimensional Circumflex (AB5C; Hefstee, de Raad, Goldberg, 1992) this study utilizes Costa and McCrae’s Five Factor Model (FFM) (1992), as not only is it considered the most popular personality measure in I/O psychology research, but it has also been shown to more accurately predict workplace outcomes when compared with other Big 5 measures (Salgado, 2003). According to Costa and McCrae’s (1992) NEO PI-R, extraversion is conceptualized as the combination of six facets: warmth, gregariousness, assertiveness, activity, excitement-seeking, and positive emotions.

Carl Jung, perhaps the first scholar to introduce the terms “extroversion/introversion” to the field of psychology, described extroversion as an “interest in the external object, responsiveness, and a ready to be influenced by events” (Jung, 1971, p. 549), which was later operationalized by the MBTI as an “attitude that orients attention and energy to the outer world” (Myers & McCaulley,
Despite Jung’s lack of psychometric background, his theory of personality has since been represented in measures such as the Jungian Type Survey (Mattoon & Davis, 1995), the Singer Loomis Inventory (Singer & Loomis, 1996), and the MBTI (Myers & McCaulley, 1985). In contrast to the Big 5’s approach to construct development, these measures began with extraversion/introversion as a representation of Jung’s theory and items were designed to psychometrically represent this viewpoint. Importantly, it should be noted that Jungian measures use the spelling of extroversion, while Big 5 taxonomies spell the term extraversion. For the purpose of this paper, we will use the term extraversion throughout.

The construct of extraversion has been used in I/O psychology to predict some of its most investigated variables, including job performance (Bartrum, 2005) and job satisfaction (Judge, Heller & Mount, 2001). However, we believe this construct may also explain in what environments employees are likely to excel in performance and experience high levels of job satisfaction. Person-environment (PE) fit describes “the match between attributes of the person and attributes of the environment” (Roberts & Robbins, 2004, p. 89), and this construct has been observed to affect job performance, job satisfaction, organizational commitment, and turnover intentions (Kristof-Brown, Zimmerman, & Johnson, 2005). We attempt to demonstrate how a Jungian conception of extraversion influences the extent to which the employee fits within the physical work environment, and subsequently, how this fit predicts perceived job performance and job satisfaction.
If supported, these ideas could contribute to (a) research by highlighting the value of an alternative conception of extraversion (Jungian) and PE fit (focusing on the physical environment) and (b) practice by arming organizations with strategies to craft the working environment in a manner that elicits optimal employee performance and satisfaction.

Due to its popularity and predictive validity, this study will feature Costa and McCrae’s (1992) NEO Personality Inventory Revised (NEO-PI-R). For the purpose of this study, the NEO-PI-R will be approximated with a version designed to represent this measure from the International Personality Item pool (Maples, Guan, Carter, & Miller, 2014). Likewise, the MBTI will represent a Jungian conception of extraversion, as not only is it by far the most popular measure of Jungian theory, but it is also one of the most used personality measures in the world (Schaubhut & Herk, 2009). The following sections will first outline the Big 5 and MBTI in terms of historical development, psychometrics, and current state of research within IO psychology. Next, the conceptualization and psychometric representation of extraversion will be compared and contrasted according to the lexical factor analysis perspective and the Jungian perspective. Finally, a Jungian conception of extroversion will be integrated into research on PE fit and the physical work environment.
The Big 5

History of the Lexical Approach

A taxonomy is a systematic classification, and over the last century, personality taxonomies have dominated this subject’s empirical investigation. Such taxonomies rest on the lexical hypothesis, proposing that individual differences become encoded into language, with the most prevalent and important personality characteristics most likely to be linguistically represented by a term that describes them (John, Angleitner, & Ostendorf, 1988). English statistician Francis Galton is credited as the first researcher to categorize language, as he gathered 1,000 language descriptors via dictionary search (John et al., 1988). Decades later, Allport and Odbert (1936) conducted the first large scale lexical analysis of the English language, as they combed through 550,000 words, eventually establishing 18,000 words that distinguished human behavior, broken down into four categories.

As described by John et al. (1988), in an effort to establish a taxonomy of universal personality descriptions, Cattell examined Allport and Odbert’s first category, made up of stable traits, and subcategorized these descriptors into roughly 185 clusters based on similarity. After a series of analyses using peer ratings and factor analysis, Cattell observed the emergence of 16 factors. Much of Cattell’s process of designing, trimming, and collapsing clusters is not entirely understood by lexical researchers, as important details were absent in many of his publications. Although ensuing factor analyses have not replicated Cattell’s findings, many have employed his clusters as a starting point that, when factor analyzed, have yielded
what eventually became the five dominant factors in contemporary personality (Digman, 1990).

**The Emergence of Five Factors**

Fiske (1949) was perhaps the first taxonomist to identify five overarching factors using 21 of Cattell’s bipolar scales (Digman, 1990): Confident Self-Expression, Social Adaptability, Conformity, Emotional Control, and Inquiring Intellect. Tupes and Christal (1961), again using Cattell’s bipolar scales, applied a factor analysis to notably diverse samples, and again five factors emerged: surgency, agreeableness, dependability, emotional stability, and culture. Notably, the work of Norman (1967) accelerated our understanding of these five factors, as his analysis of 2,800 trait terms required participants to offer the definition and social desirability of each term, a significant increase in thoroughness and complexity compared with the less than clearly documented strategy of Cattell. Nonetheless, Norman observed the emergence of five distinct factors: Surgency, Agreeableness, Conscientiousness, Emotional Stability, and Culture. Importantly, John et al. (1988) point out that numerous studies that did not rely on Cattell’s clusters have found similar factors (e.g., Conely, 1985; Digman, 1983; Goldberg, 1981) further supporting its universality.

The work of Goldberg, particularly in the early 1980s, served to advance the hierarchical understanding of the Big Five. Noticing some deficiencies in Norman’s categorization strategy, Goldberg (1982) constructed a revised, systematic process of term categorization. Norman’s strategy resulted in terms such
as confident/unconfident assigned to potentially different factors. Goldberg, as a result, considered the bipolar descriptive contrast of terms during multiple levels of evaluation, and thus took into account the contrast and social desirability of each term. Beginning with Norman’s 2,797 “stable trait” terms, Goldberg trimmed down the pool of terms to 1,710. In an examination of these terms, Goldberg observed the reemergence of the same five factors; however, when several strategies of factor analysis were employed, two additional, albeit smaller, factors emerged—culture and morality—evidencing that a lexically derived taxonomy of personality may be accurately represented by a “Big 5” and a “Little 2” (Goldberg, 1982).

In an attempt to establish the generalizability of the five factors, Goldberg (1990) conducted three studies. Study one employed five separate factor analysis techniques, all yielding the emergence of the same five factors. Goldberg’s second study called upon independent lexicographers to categorize adjectives. Both self-ratings and peer descriptions were used to factor analyze the terms, and yet again, five factors clearly emerged. Using the same terms, study three required participants to note the extent to which they agreed with these ratings, resulting in 100 clusters that when analyzed yielded the emergence of the, by now familiar, five factors.

Contemporary personality research recognizes the Big 5 to consist of extraversion (or surgency), agreeableness, conscientiousness, neuroticism (or emotional stability), and openness to experience, and these factors are represented in numerous personality measures such as the BFI (John, Donahue & Kentle,
1991), AB5C (Hefstee, de Raad, Goldberg, 1992), the Big Five Aspects Scales (BFAS; DeYoung, Quilty, Peterson, 2007), and the NEO-PI-R (Costa & McCrae, 1992).

**The Five Factors in Questionnaire Form**

Costa and McCrae, widely regarded as the Big 5’s most influential investigators, published a questionnaire in 1985, based on Cattell’s early research, called the *NEO Personality Inventory* (NEO-PI). The NEO-PI, however, was constructed from Costa and McCrae’s 1976 analysis of Cattell’s 16-factor inventory, and indicated only three main clusters—extraversion, neuroticism, and openness (formerly referred to as culture). It was not until 1992 that Costa and McCrae published what would be recognized as the seminal five factor model questionnaire: *NEO Personality Inventory Revised* (NEO PI-R). With the addition of agreeableness and conscientiousness, Costa and McCrae capitalized on nearly a decade of lexical analysis to produce a 240-item questionnaire measuring neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness, with each domain encapsulating six sub facets, measured by eight Likert scale questions. In conjunction with the NEO PI-R, Costa and McCrae developed and validated the NEO Five Factor Inventory (NEO-FFI), a shortened version consisting of just 60 items, 15 for each factor, that offered the highest absolute loadings for their respective factor.
FFM Reliability and Validity

As noted, a number of measures of the Big 5 have been developed. Research on these scales has demonstrated that these constructs can be measured with adequate levels of reliability and validity. To illustrate this, evidence related to the widely used NEO-PI-R and NEO-FFM will be reviewed.

The internal consistency of the NEO PI-R’s factors range from .86 to .92, with facet’s ranging from .56-81, while the NEO-FFM’s factors are observed to yield internal consistencies between .68 and .86 (Costa & McCrae, 1985). In addition, strong test-retest reliability has been observed: The NEO-FFM’s two week test-retest reliability has been demonstrated to be exceed .86 for each factor (Robins, Fraley, Roberts, & Trzesniewski, 2001), and test-retest reliability over six years has demonstrated the NEO-PI-R factor’s as between .79 and .83 for adults (Costa & McCrae, 1992).

Costa and McCrae’s FFM manual offers an extensive list of measures that have been validated against each domain, but specifically construct validity has been demonstrated with peer ratings, spousal ratings, and self-reports (McCrae, Stone, Fagan & Costa, 1998). Regarding the NEO-FFM’s predictive capabilities, criterion-related validity has been firmly established, as its factors predict college GPA (Conard, 2006), emotional burnout (Cano-García, Padilla-Muñoz & Carrasco-Ortiz, 2005), physical health (Grucza & Goldberg, 2007), work performance (Barrick & Mount, 1991), alcohol consumption (Hopwood et al. 2007), aggression
(Skeem et al. 2005), and social functionality (Eisenber, Fabes, Guthrie, & Reiser 2000).

Although developed in the United States, the FFM has been examined across numerous cultures. Despite some conflicting evidence, researchers generally consider this evidence strong. Participants from particularly distinct cultures (German, Hebrew, Chinese, etc.) have been measured on translated versions of the NEO-PI, offering compelling psychometrics across cultures. Generally, research that has examined developed countries has found stronger psychometric evidence for the FFM (Gurven, Reuden, Massenkoff, Kaplan, & Vie 2013).

**Weaknesses/Limitations**

The underlying assumption supporting the Big 5 is that of the lexical hypothesis, assuming that the more prevalent a personality characteristic, the more likely it is to be represented by a single word. However, some authors have cast doubt on the legitimacy of this claim. John et al. (1988) address four potential flaws in the lexical hypothesis. First, the conditions under which language developed are not entirely understood, and thus it may not be appropriate to transform this into scientific classifications. Therefore, it is very possible that important distinctions in personality, relevant to its scientific inquiry, are not encapsulated in a single term. Second, language is not constant among different cultures and geographic locations, and it is subjected to change. Third, the way in which a term is commonly used is highly context dependent and not as definitive as what its definition in a dictionary may present. In support of this point, Block (1995)
explained how some terms can be descriptive of unrelated behavior: “aggressive” can describe one’s propensity to seize an opportunity or one’s tendency towards hostility. Fourth, the analysis of language yields hierarchical categories, yet it is unclear whether personality is best represented as a hierarchical structure. John et al. (1984) presented a very similar reservation in that scholars must be cautious in translating common language into scientific constructs. Thus, the legitimacy of the Big 5 rests on the adequacy of the lexical hypothesis, a notion some researchers have cast doubt upon. However, assuming its sufficiency, the factor analysis of language may be best used as a basis to begin the construction of a personality construct, while welcoming other exploratory strategies that are complementary.

Beyond the assumptions of the lexical hypothesis, the methodology of factor analysis has not been universally agreed upon. Scholars often reference the consistent emergence of the five factors among different samples and data collection methods as a strength of the Big 5 taxonomy; however, a closer inspection of the factor analysis strategies may reveal this consistency as less impressive. According to Corulla (1987), the factor analysis of terms that have previously been fit into orthogonal categories will likely yield the same factor when similar factor rotation methods are used. To this point, Block (1995) explained that the clustering techniques used to narrow down thousands of terms into a few meaningful clusters “prestructured” the emergence of similar factors, allowing the repeated emergence of these factors to possibly reflect the original formation of clusters rather than the robust emergence of five factors. Furthermore, despite
replicated emergence, an ideal orthogonal rotation strategy, and thus a set number of factors, has not been agreed upon among scholars, allowing for researchers to endorse contrasting models (Eysenck, 1991 - 3 factors; Jackson, Paunonen, Fraboni, & Goffin, 1996 - at least 6 factors; Almagor, Tellegen, & Waller, 1995 - 7 factors).

Moreover, Block (1985) questioned the underlying assumption of factor analysis: “the amount of variance "explained" internally by a factor need not testify to the external psychological importance of the factor” (p. 189). In further support of this point, Paunonan and Jackson (2000) evidenced that several other personality characteristics, such as conservative, humorous, and conceit could be observed through a factor analysis that did not prioritize identifying only the largest factors. Oswald and Hough (2011) endorsed a shift in how the FFM is used in applied settings, advocating that a nuanced examination of sub facets may offer more relevant information than simply considering the entire factor itself. If this is the case, it is plausible that the smaller factors that Paunonan and Jackson observed may represent untapped value in applied settings.

Over and above the Big 5’s method of construction, scholars have questioned the universality of these personality characteristics. Despite some evidence suggesting the cross-cultural emergence of these five factors, the body of research on this subject, as a whole, is mixed. Gurven, Rueden, Massenkoff, Kaplan, and Vie (2013) pointed out that the majority of attempts to cross-culturally validate the Big 5 have used a sample that is westernized, industrialized, and
wealthy. Attempting to investigate the innate universality of the five factors, Gurven et al. (2013) sampled an indigenous Bolivian tribe. Self and spousal reports were analyzed with exploratory factor analysis, confirmatory factor analysis, and Procrustes rotation analysis (the strategy commonly used in McCrae & Costa studies; e.g., McCrae et al. 1996), yet results did not produce an emergence of the five factors, casting doubt on this model’s ubiquity. Importantly, Gurven et al. (2013) observed the emergence of a factor of extraversion and agreeableness items.

Possibly related to the disparity in validity evidence observed across cultures, questions regarding the FFM’s construct validity have been posed, especially during the end of the 20th century when doubt was cast on the sampling methods used to observe the emergence of five factors. To reexamine the construct validity of the NEO-FFM, Holden, Wasyliw, Starzyk, and Edwards (2006) asked undergraduates to create their own item-categories in an effort to observe the level of inferred factor agreement. A cluster analysis revealed that participants offered four dimensions: openness, conscientiousness, sociability, and energetic coping. Notably, similar to what Gurven et al. (2013) would observe seven years later in their study of an indigenous population, Holden and colleagues reported a factor they called sociability, comprised of agreeable and extraversion items, while energetic coping included only items from the extraversion dimension. Holden et al. (2006) further analyzed this inferential structure by utilizing peer ratings and self reported behaviors, examining construct and criterion validity, and found further psychometric support of this inferred four-factor solution. Specifically, the
authors note that several of the extraversion items appeared to load more appropriately under a “sociable” dimension, capable of perhaps representing its own factor (similar to Hogan’s, 1986, and Hough’s, 1992, division of extraversion), distinct from McCrae and Costa’s extraversion.

In addition, some scholars have taken issue with the Big 5’s lack of theoretical basis. A model of personality according to Block (1995) should be “theory reflecting rather than construct issued” (p. 188). To this end, a falsifiable hypothesis has not accompanied the factor analyses that produced five factors. Further, Gurven et al. (2013) recently stated a similar concern, explaining that FFM’s inductively derived taxonomy exists without any theoretical basis. As a result, according to Gurven and colleagues, there are no a priori reasons to anticipate the emergence of these five factors, an especially salient shortcoming when studies of non-western societies fail to observe the emergence of the FFM (e.g., Schmidt et al. 2007). This suggests that the assumed biological roots of this taxonomy (Costa & McCrae, 1998) may be premature.

Although not offered a priori, some researchers have attempted to build a theoretical model around the Big 5 in an effort to add to this taxonomy’s capacity to explain human behavior. McCrae and Costa (1996) presented a meta-theoretical framework designed to give context to the FFM and offer a blueprint to better understanding personality development. Composed of 5 elements, this model presents the foundation of what personality theorists traditionally have included to interpret personological differences: basic tendencies, involving the raw material of
personality influenced by genetics and early childhood experiences; characteristic adaptations, including habits, social roles, and perceptions of others molded from individual/environmental interactions; self concept, involving evaluation of self, including self-esteem and sense of purpose; objective biography, involving significant life events, including thoughts and behavior; and external influences, including parent/child relationships, socialization, and culture. This meta-theoretical model places the Big 5 in the category of basic tendencies, thus assuming a high degree of genetic origin, and postulates that they directly influence characteristic adaptations and self-concept. Although this model offers theoretical richness, researchers, to our knowledge, have failed to accept Costa and McCrae’s invitation to corroborate it with empirical support. Additionally, studies at the turn of the century began to cast skepticism on the degree to which the FFM is cross-culturally present (e.g., Gurven et al. 2013; Schmidt et al. 2007), implicitly contradicting the notion that the FFM should be considered a basic tendency.

Lastly, and perhaps most pertinent to the objective of the current study, the Big 5, although heavily validated and predictive of workplace outcomes, seems to offer a shallow scope in depicting and explaining individual differences in thoughts feelings, and behavior, as it originates from clusters of similar adjectives as opposed to an assumption of the human condition. Importantly, we do not believe this to be an inherent weakness, as a model’s simplicity does not detract from its ability to predict workplace behaviors. However, a simplistic depiction of personality may be limited in the degree to which it may shed light on the complex
nature of individual differences. Although not a commonly discussed limitation of the Big 5, some authors have discussed its lack of complexity. Block (1995) explained that the complex, dynamic nature of personality might not be appropriately represented with a single term:

How does one convey with suitable single-word descriptors the person who, confronted with an anxiety-inducing decision situation, is quickly decisive, not with the confidence that rapid decision is so often interpreted to imply but only to get past the stress of the situation? (p. 196).

Similarly, Paunonen (2003) suggested that an impressive feat in personality research would be the ability for a personality measurement to predict human complexities rather than merely indicating traits that obviously relate back to the construct itself. Thus, instead of viewing the Big 5’s simplicity as a weakness, we invite scholars to view this as an opportunity to welcome alternative conceptions of personality that could exist alongside and complement organizational psychology’s most prominent approach to personality.

**Big 5 in Organizational Psychology**

The Big 5 has been extensively studied in organizational settings. One major example of this has been in the area of personnel selection. For much of the 20th century, the use of personality measurement in personnel selection was not endorsed by organizational literature. Guion and Gottier (1965), after reviewing over a decade of personality research, influentially denounced the use of personality measures in personnel contexts, setting the tone for organizational
scholars to impeach its use in selection for the next 25 years. In 1991, Barrick and Mount famously meta-analyzed 117 published and unpublished studies from 1952 to 1988, examining professionals, police, managers, sales, and semi-skilled/unskilled jobs. They found as predicted, that conscientiousness predicted all three measures of employee performance (job proficiency, training proficiency, and personnel data) across all five job categories. Extraversion was found to predict performance of managers and sales occupations, as well as the training performance of all five occupations. Soon after, Tett, Jackson, and Rothstein (1991) meta-analyzed 97 independent samples, further confirming that emotional stability, agreeableness, and conscientiousness significantly predicted employee performance.

Over the next decade, many studies endorsed personality’s prediction of job performance (Bartram, 2005; Clark & Robertson 2005; Hogan & Hogan 2003; O’Connor & Paunonen, 2007), including several additional meta-analyses (Barrick, Mount & Judge, 2001; Borman, Penner, Allen & Motowidlo, 2001; Hough, 1992; Salgado 1997). In particular, these studies suggested that conscientiousness and emotional stability predict job performance across virtually all occupations. Specific to personnel selection, conscientiousness and emotional stability have been observed to offer incremental validity over and above general intelligence (Salgado, 1998).

Job satisfaction, another heavily studied workplace outcome, has also been linked to extraversion. Judge, Heller and Mount (2002) investigated the
relationship between the Big 5 and job satisfaction by meta-analyzing 163 independent samples, reporting a .25 correlation between extraversion and job satisfaction. Research has suggested that dispositional characteristics may significantly influence job satisfaction (Watson & Slack, 1993), and extraversion, considered a disposition (Bouchard & Loehlin, 2001), has been one of several traits linked to satisfaction. Lastly, several studies have meta-analytically demonstrated the Big 5’s extraversion to predict training proficiency (Barrick & Mount, 1991; Barrick, Mount, & Judge, 2001; Hough, 1992), another heavily studied workplace outcome.

In sum, the Big 5 was derived from the cumulative efforts of lexical analyses spanning decades. Several Big 5 measures including the NEO-PI-R have been observed to yield solid psychometrics, and as a result this has become the dominant measure of personality in I/O psychology, with many studies demonstrating its predictive capabilities. We believe, however, that amidst the momentum of the Big 5, our field has neglected to consider other conceptions of personality that may complement this approach to personality measurement. The MBTI’s conception of personality contrasts that of the Big 5; therefore, its potential to complement may be the highest. The MBTI is subsequently reviewed.

MBTI

Origin

Carl Jung, widely regarded as one of the most influential thinkers of the 20th century and the founder of analytical psychology, published *Psychological Types* in
1921, considered to be his most influential literary work (Jung, 1971). Psychological Types offers Jung’s thoughts on human personality based on decades of observations and interactions with thousands of psychiatric patients. Specifically, Jung described three categorical preferences:

“extraversion/introversion” as one’s general orientation to the world,
“intuition/sensing” as one’s information processing preference, and
“thinking/feeling” as one’s decision-making preference. Several researchers have attempted to translate Jung’s theoretical ideas into psychometrically sound measures, such as the Jungian Type Survey (Mattoon & Davis, 1995), the Singer Loomis Inventory (Singer & Loomis, 1996), and the MBTI (Myers & McCaulley, 1985).

**Historical Overview of MBTI**

As described by Quenk (2009), Katherine Briggs and Isabell Briggs Myers began working on what would become the Myers-Briggs Type Indicator (MBTI) during World War II. In 1943, almost 20 years after Briggs and Myers began studying the work of Carl Jung, the first version of the MBTI was produced. Notably, in addition to translating Jung’s three aforementioned preferences into respective dimensions, Briggs added a fourth dimension “judging/perceiving” to decipher whether the second or third dimension appeared as either an extraverted or an introverted expression, a concept she felt was implicitly referenced throughout Jung’s *Psychological Types*. In 1956, the MBTI was first published by Educational Testing Service (ETS), but was available for research purposes only, allowing the
psychometric evidence to accelerate. In 1962, the first MBTI manual was published, and 13 years later the instrument was published by the Consulting Psychology Press (CPP), resulting in widespread availability. The two most current versions of MBTI are form M (1998) and form Q (2001), the latter of which introduced the concept of facets, offering five for each preference.

Reliability and Validity

Myer and McCaulley’s (1985) MBTI manual was, at the time of publication, the most comprehensive review of the MBTI’s psychometrics to date, and is often still referenced. According to this manual, an aggregated sample of 55,971 participants yielded internal consistencies of .83, .86, .84, and .87 for the four preferences, and test-retest studies of nine separate samples observed test-retest correlations (spanning from 5 weeks to 2.5 years) between .73-.91. However, the thinking-feeling (TF) dimension was observed to fall short of the accepted .70 threshold in several samples. Overall, at the time of this publication, the four MBTI preferences yielded adequate reliabilities in almost all adult samples, with slightly lower coefficient alphas for samples of younger participants and those with lower general intelligence. Myers and McCaulley demonstrated validity evidence by providing convergent and discriminant correlations with hundreds of measures including established personality measures (e.g., Eysneck Personality Inventory [EPQ], EPQ, MMPI, The Sixteen Personality Questionnaire [16FP]) and criterion-related evidence with attitudes and values (e.g., Opinion Attitude and Interest
Scales) and interests (e.g. Strong-Campbell Interest Inventory, Kuder Occupational Interest Survey).

The current versions endorsed and sold by the Myers Briggs foundation are form M (93 items) and form Q (144 items), published in 1998 and 2001, respectively. The MBTI Form M manual (Myers & Myers, 2009) reports strong psychometrics. In samples of working adults, students, and retired persons, internal consistency reliabilities of .86-.92 were observed for the four preferences. This form of reliability was also reported to exceed .80 across cultures (Africa, Asia, Australia, Europe, Latin America, and Middle East/North Africa) and across ages (<20, 21-29; 30-39; 40-49; 50-59; and 60+). Test-retest reliabilities of 3 weeks, 1-6 months, 6-12 months, and up to a year have been shown to indicate adequate stability, as most of the preferences exceeded .70 across all four test intervals. Additionally, validity was established with a number of personality measures (California Psychological Inventory 260, Fundamental Interpersonal Relations Orientation-Behavior Assessment, NEO-PI) and occupational interests (Strong Interest Inventory, Birkman Method Assessment), among other measures.

The MBTI Form Q introduced the concept of facets, offering five per dimension. The MBTI Step II (2011) manual offers reliability evidence to support the appropriateness of its facets, with most, but not all, internal reliabilities exceeding .70 across employment status (employed full time, employed part time, full-time student, retired, and not working for income), ethnic group (African American, Native American/Alaskan Native, Asian, Caucasian, Indian,
Latino/Hispanic, Middle Easterner, Pacific Islander/Native Hawaiian, and Multi-Ethnic), age (<20, 21-29; 30-39; 40-49; 50-59; and 60+), and region (Africa, Asia, Australia/New Zealand, Europe, Latin America, and Middle Eastern/North Africa). Notably, one facet of the TF dimension, questioning-accommodating, yielded a markedly low coefficient alpha, often times less than .50. Furthermore, test-retest reliabilities across 3 weeks, 1-6 months, 6-12 months, and >1 year demonstrate good stability, as the 20 facets exceed .70 in 68 of the 80 data points. Validity evidence for the MBTI facets has established construct validity via confirmatory factor analysis (Quenk, 2009) and convergent and discriminant correlations (Big 5, CPI, Adjective Check list; Schaubhut & Thompson, 2011). Criterion-related validity has been observed with stress, relationships, values, and coping strategies (Quenk, 2009).

Aside from MBTI publishers, many independent researchers have examined the MBTI’s validity and observed solid psychometrics. Tompson and Borello (1986) factor analyzed MBTI items from a sample of 396 college students and observed that almost every item of the four sub scales loaded onto the expected factor, adding to the body of research that suggested this scale’s firm construct validity (e.g., Buros, 1981; Keen & Bronsema, 1981; Tzeng et al. 1983). Particularly regarding the appropriateness of the MBTI’s use in organizational psychology, Gardner and Martinko (1996) reviewed the psychometric evidence and not only supported the use of this instrument, but also encouraged researchers to
continue using this measure to investigate leadership and conflict management dynamics.

**Weaknesses/Limitations**

Despite the ostensibly convincing psychometrics reported by the MBTI manual, many researchers have questioned the legitimacy of these statistics and the scoring methods endorsed by the MBTI authors. For example, Myers and Briggs’ Judging-Perceiving scale has been called into question (Boyle 1995; McCrae & Costa, 1989). Rather than being directly addressed in Jung’s *Psychological Types* (1921), the MBTI’s original authors chose to add this scale, interpreting it as addressing Jung’s notion that either the S-N or T-F dimension was “dominant” or “auxiliary.” Therefore, its function in the instrument is not only to reflect a propensity to describe casual versus systematic behavior, but also to indicate a priority among preferences between the second and third dimension. This fourth dimension has been observed to be the psychometrically weakest (Myers & McCauley, 1985; Myers & Myers, 2009), and according to McCrae and Costa (1989) no data have emerged to suggest this preference has a reliable influence on the N-S and T-F preferences.

After continued skepticism regarding the MBTI’s psychometric properties, the National Academy of Science reviewed 20 MBTI studies, concluding a definitive lack of psychometric support (Nowack, 1996). In particular, one study reported that 47% of participants were assigned a different type, or four-letter combination, after a five-week test-retest interval. Moreover, the MBTI’s construct
validity was also deemed unacceptable, as the National Academy of Science reported that only the E-I dimension appeared to offer consistently high convergent and discriminant evidence (Nowack, 1996). Over and above the reliability and validity of the MBTI’s four dimensions, this measure’s exclusivity and exhaustiveness has been called into question. For instance, an item analysis revealed six clusters of items, rather than four (Sipps, Alexander, & Freidt, 1985). Additionally, the S-N and J-P dimensions appear to be correlated (McCrae & Costa, 1989), suggesting shared variance between constructs, a notion generally frowned upon among psychometricians.

Perhaps the most controversial feature of the MBTI is its reliance on typology rather than the generally accepted trait conception of personality measurement, resulting in two psychometric concerns. First, the measure’s test-retest reliability suffers when the scores are dichotomized as one preference or the other, as test takers with a slight preference can be reclassified with the opposite preference on the basis of a slightly different score. Unfortunately for the empirical reputation of this instrument, this shortcoming is perhaps the root of the distrust among researchers, as some psychometricians have seemed apprehensive to invest complex analysis in an instrument that may not be reliable. Second, the MBTI’s typology suggests a bimodal distribution within a population, whereby two normal curves are expected to be observed. However, evidence for the legitimacy of a bimodal distribution has not been convincing (Bess & Harvey, 2002).
Some scholars have suggested a phenomenon likely to be spuriously shrinking the MBTI’s test-retest reliability: the method of score calculation. Salter, Forney, and Evans (2005) investigated whether employing alternative scoring methods impacted the MBTI’s validity. The MBTI manual describes a formula with which one’s Preference Clarity Index (PCI) can be calculated, signifying the degree to which the instrument can decipher a test taker’s preference (i.e., how confident the test is in its indication of one preference over the other). The PCI score is calculated by observing the amount a score deviates from 100 (which theoretically represents no preference) in terms of absolute value. Therefore, the higher the score, the more confident the MBTI is in indicating one’s preference. Salter et al. (2005) point out that reliance on this scoring method may artificially decrease reliability. In the case of a hypothetical test-retest situation, one could receive a PCI score of Introverted-5 and Extroverted-5, implying the instrument is equally confident (or in this case unconfident) that the test taker’s preference was introversion during the first administration and extroversion during the second administration. However, when reliability analyses are conducted using this scoring method, the test taker would be assigned scores of introversion of 5 and introversion -5, respectively. Alternatively, the MBTI scales, according to Salter et al. (2005), can be calculated to form true continuous data, in which case the example above would yield scores of 105 and 95. When this method of calculation was used as opposed to the PCI score, test-retest correlations of just under two years increased dramatically. Problematically, the MBTI handbook (Myers &
McCaulley, 1985) recommends that researchers use PCI scoring when calculating psychometrics, and as a result, many, if not most, of the empirical research that has criticized the MBTI’s reliability, and thus added to its negative stigma, may have done so on the grounds of a flawed scoring method. Despite effort among some researchers, such as Salter et al. (2005), to clarify under which circumstances the MBTI may produce less than satisfactory psychometrics, the momentum of empirical stigma seems too heavy for the MBTI to shake, as more evidence may be needed before the majority of I/O researchers are willing to consider using this scale.

In sum, skepticism regarding validity, doubt concerning the theoretical legitimacy of the fourth preference, and a reliance on a perhaps unlikely bimodal distribution assumption has led to the empirical denouncement of the MBTI. As a result, its inclusion in I/O psychology studies pales in comparison to that of the Big Five. In spite of the improved psychometrics of Form M and Form Q, it appears as though the prevailing notion among researchers remains steadfast, as the MBTI still carries a stigma of psychometric illegitimacy.

**MBTI in Industrial/Organizational Psychology**

While the Big 5 has been considered to be the predominant approach in academic research settings, the MBTI has also been used to study management and counseling, perhaps explaining in part why this instrument is prevalent in applied settings (Moutafi, Furnham, & Crump, 2007). However, for the purpose of this study, research in applied settings other than organizations will not be reviewed.
After reviewing 37 studies that used the MBTI to examine managerial behaviors, tendencies, and effectiveness, Gardner and Martinko (1996) proposed 20 propositions summarizing the extant research on this topic. Outcomes such as conflict strategies, decision making styles, and tolerance to risk were reviewed and determined to be appropriately predicted according to type preference. In addition, the authors concluded, after reviewing over 20 studies which examined the MBTI’s psychometrics, that its use in academic settings is appropriate and capable of providing unique insight. Additionally, the MBTI has been demonstrated to predict conflict management (Killman & Thomas, 1975), leadership styles and tendencies (Roush & Atwater, 1991), and income (Rice & Lindecamp, 1989). Subsequently, journal articles have been published that provide recommendations to practitioners on how to most effectively use the MBTI (e.g., McCaulley, 2000; Sample, 2004). Lastly, the MBTI has even been used in studies specific to organizational psychology: Bradley-Geist and Landis (2012) used this measure to demonstrate that the attraction-selection-attrition model resulted in homogeneous personalities among occupations and organizations.

Beyond simply predictive value, the MBTI has been at the forefront of successful organizational interventions. Dubey, Agrawal, and Palia (2001) administered the MBTI to 90 executives of a private company, using the results to design an intervention addressing team performance, communication, and interpersonal relationships. Not only were these outcomes reported to improve post intervention, but the company also observed a more efficient use of resources,
resulting in an increase in production and decrease in cost. Similarly interested in the MBTI’s effectiveness in organizations, Garrety (2007) interviewed HR practitioners, superintendents, and supervisors in an effort to elucidate this instrument’s perceived value in organizations. This researcher observed mixed, but overall positive perceptions, as employees reported benefits in the areas of self-knowledge, interpersonal relationships, and teamwork. For example, one HR practitioner reported, “I can now understand the people I’m working with better. So, it was used as a bit of a short-cut, a short circuit there to conflict, actual or potential conflict” (Garrety, 2007, p. 224). The MBTI is generally considered a resource for practitioners and is less commonly used in I/O psychology research. Although its use in journal articles is not uncommon, studies that have used the MBTI within the domain of I/O psychology research are often found in journals such as *The Journal of Psychological Type*, which specifically caters to a typology approach, while being virtually nonexistent in journals such as *Journal of Applied Psychology* and *Personnel Psychology*.

**Big 5 versus MBTI: A Comparison of Extraversion**

**Conceptualizations**

**Big 5/NEO-PI-R**

Although ostensibly similar due to the shared factor name, the Big 5’s conception of extraversion may contrast that of the MBTI more than expected. As described earlier, the Big 5’s factors were derived from factor analyses of terms over the course of several decades. First labeled “surgency” by Norman (1967) and
Tupes and Christal (1963), the Big 5’s first factor, extraversion, is generally considered to be the first of Eysenck’s proposed “highest-order traits,” consisting of extraversion and neuroticism (Digman, 1990). Researchers have reported a myriad of different facets composing extraversion, depending on their factor analytic method and the pool of terms analyzed. For instance, Goldberg (1990) analyzed Norman’s 75 categories of 1,431 terms, reporting that extraversion consisted of 17 subcategories (e.g., talkativeness, adventure, vanity, pessimism, silence), each consisting of between 5 and 44 terms. The measure reviewed in this paper, Costa and McCrae’s NEO-PI-R, presents extraversion as the sum of six facets: warmth, gregariousness, assertiveness, activity, excitement seeking, and positive emotions.

Importantly, one’s score on a given factor of a lexically derived personality measure, such as the Big 5, does not come with any inherent meaning, other than what is indicative at a face value examination of this scale. In other words, one’s score on a factor is composed of item responses of behavioral, cognitive, and affective manifestations of the trait (which in the case of extraversion, are mostly behavioral [Zillig, Hemeover, & Dienstbier, 2001]), and therefore indicate only the degree to which one is likely to manifest these expressions of personality. For example, it can be observed that a lower score on the extraversion facet of positive emotions indicates solely that the respondent is less likely to experience positive emotions. As a result, the existence of a score on a Big 5 factor indicates no more than what can be indicated by the responses to its items. It should be noted that this
is not meant to be a critique of any factor analytically derived measure, as what the Big 5 lacks in underlying theory, it makes up for in decades worth of analytical precision.

In comparing extraversion according to the MBTI and the FFM, an additional fundamental distinction emerges: The MBTI’s conceptualization of the extraversion/introversion typology as one’s preference towards external or internal orientation, lends introspection as essential to its operationalization. Proponents of the Big 5 have criticized the inclusion of introspection in extraversion, citing that the MBTI’s conception perpetuates confusion between social and thinking manifestations of extraversion, as factor analyses have not demonstrated introspective terms to load onto the extraversion factor (McCrae & John, 1992). In doing so, these authors seem to imply that considering personality instruments that are not conceptually congruent with the factor analytic conclusions that led to the Big 5 may not be appropriate, suggesting the lexical hypothesis as not just the most important foundation of personality construction, but in fact the only method of personality construction.

**MBTI**

In *Psychological Types*, Jung described extroversion as an “interest in the external object, responsiveness, and a ready to be influenced by events” (Jung, 1971, p. 549). Conversely, Jung referred to introversion as “being directed not to the object but to the subject” (p. 550). Although described in an abstract, philosophical manner, Jung spent much of his book expanding upon the meaning of
these terms. Myers and Briggs began studying *Psychological Types* in 1923, when it was printed in English, and spent the next 20 years studying this text. Eventually, they summarized Jung’s thoughts by explaining that extroverts are oriented and energized by the outer world of events; they prefer to engage with the environment, use it for stimulation, and are likely to act on it impulsively (Myers & McCaulley, 1985). Introverts are oriented and energized by their inner world; they are mainly interested in concepts and ideas and generally enjoy time alone (Myers & McCaulley, 1985). Deviating from the factor analysis approach of the Big 5, MBTI dimensions begin with a fundamental assumption of human personality and items are then written that aim to reflect this assumption. This allows the MBTI to offer a theoretical basis to personality, as opposed to the Big 5’s linguistic approach. The MBTI has historically measured its dimensions without the use of facets, until Form Q was introduced in 2002, offering five facets for each dimension. The facets of extraversion, according to Form Q are initiative-receiving, expressive-contained, gregarious-intimate, active-reflective, and enthusiastic-quiet (Quenk, 2009).

**Summary**

The MBTI and the FFM differ in their conceptions of extraversion. In particular, the FFM conceptualizes extraversion as almost exclusively behavioral, specifically focusing on social expressions, while not using the term *introversion* or considering it as a qualitatively different trait. The MBTI assumes introversion and extraversion are two distinct personality types, and this distinction heavily relies on one’s propensity to indulge one’s inner world, a feature of personality not
considered relevant to extraversion by the FFM. Lastly, the MBTI’s typology label of introversion or extraversion inherently comes with theoretical assumptions, while the FFM does not.

**Items/Trait versus Type**

**NEO-PI-R items**

As the successor to the NEO-PI, the NEO-PI-R, published in 1990, includes 240 items over 5 factors and 30 facets, and is written at a sixth grade reading level (Administration/Scoring, 2012) Two forms are available: Form S presents items in a self-report format, while form R offers peer-report items. The NEO-PI-R prompts test takers to indicate the extent to which they agree with a statement by responding on a 5-point likert scale. Each item aims to tap a specific term used to describe a personality trait, and these terms have been observed to consistently load on a respective factor. Importantly, the FFMs adopt a human rationality perspective to item response, which stipulates that people typically possess enough insight to accurately answer questions that require self-reports or peer reports on patterns of behavior (Costa, 1996), and empirical studies that have compared methods of item construction have observed that the rational method is similar to other methods in terms of validity (Hase & Goldberg, 1967). Rational instruments, such as FFMs, typically present literal, transparent items and research has also supported the value of this approach (Wolfe, 1993).

The NEO-PI-R, like all lexically derived personality instruments, adopts a quantitative perspective on personality measurement, also referred to as “trait”
measurement as opposed to “type” measurement. In this respect, the FFM conforms to the currently preferred approach among most personality researchers. Trait personality measurement assumes, when sampled, the given factor will form a normal distribution within a population, and this distribution has been empirically observed (Boyle, 1995). Trait personality measures are typically scored by summing scores across items; in the case of the NEO-PI-R, a factor is scored by summing one’s responses across 48 items. Importantly, this quantitative style of personality measurement does not view introversion as a qualitatively different trait from extraversion; in fact, it does not even adopt introversion as a technical term. Rather, a low score on this scale would be referred to as “low extraversion,” indicating a small amount of extraversion.

**MBTI items**

According to Myers and McCaulley (1985), the MBTI’s translation of Jung’s theory into sound items, representing four preferences, rests on three assumptions: (a) people tend toward a “true preference” of one type or the other; (b) respondents can indicate their preference by responding to items that, when aggregated, reveal their type; and (c) one’s preference falls on a dichotomous pole, with no negative or positive connotation inherent in its location. Due to this measure’s typological approach, items were written, tested, and selected or discarded based on their ability to sort respondents into a category of one preference or the other. To achieve this end, Myers and Briggs constructed items that were especially polarizing to accurately indicate strong preferences, while also
crafting items sensitive enough to differentiate among respondents of a weak preference. Because Jung’s theory of type preferences entails the notion that these are complex tendencies, Myers and Briggs’ item writing focused on seemingly trivial day-to-day behaviors, attempting to reveal the complexities of one’s preferred type, thought to be embedded in the depths of one’s unconsciousness. Lastly, in contrast with other popular personality measures, the MBTI’s item responses were specifically written to be entirely devoid of negative/positive connotations to avoid feelings of inferiority or superiority among respondents.

The MBTI adopts a qualitative or typology approach to personality measurement. Congruent with Jung’s theory on personality, while everyone fluctuates between moments of introversion and extroversion, a typology approach stipulates that there is a general disposition towards one or the other.

**Summary**

The FFM presents simple, transparent items that require the test-taker to indicate the degree to which they identify with a statement. Based on Jung’s theory of human personality, MBTI’s item writing strategy assumes an understanding of its four dimensions is not achievable without considerable familiarization with Jungian theory. Therefore, items were written to tap seemingly mundane behavioral, cognitive, and affective manifestations of complex personality preferences. Thus, the MBTI’s item writing strategy contrasts that of the FFM, as it does not grant test-takers the ability to report directly on the preferences themselves.
Reliability

**NEO-PI-R**

Psychometric evidence for the FFM’s extraversion is considered strong. Table 1 presents the reliability for NEOPI-R’s extraversion according McCrae, Kurtz, and Terracciano (2011). The extraversion factor of Costa and McCrae’s FFM has been observed to yield the highest internal consistency of the five factors and strong factor loadings across a variety of samples (McCrae & Costa, 2004).

**MBTI**

The psychometric shortcomings of the MBTI, when examined closely, may not reflect inadequacy of its extraversion dimension. The MBTI was constructed to yield 16 distinct, exclusive typologies culminating from the aggregation of four dimensions. As a result, the psychometric fortitude of a test-taker’s assigned typology is the aggregation of the reliability and validity of each of these four scales, which are often perceived as inadequate (Boyle, 1995). However, when the extroversion/introversion scale is extracted from its three counterparts, it appears to yield solid psychometric evidence. To this end, the National Academy of Science reviewed over 20 studies and cited the extraversion-introversion dimension as the MBTI’s only dimension of adequate construct validity. The reliability of the MBTI’s extraversion is presented in Table 1, according to data retrieved from Schaubhut and Herk (2009). As can be observed, the two measures are comparable in their reliabilities.
Summary

Both the MBTI and FFM version of extraversion have demonstrated solid reliability, with many authors citing this preference/factor as the most psychometrically sound in relation to both measures.

Table 1

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<th>NEO-PI-R Reliability</th>
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<tr>
<td><strong>Internal Consistency</strong></td>
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<td>Extraversion</td>
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<td>E1: Warmth</td>
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<td>E2: Gregariousness</td>
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<td>E3: Assertiveness</td>
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<td>E4: Activity</td>
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<td>E5: Excitement Seeking</td>
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<td>E6: Positive Emotions</td>
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<th>MBTI Reliability</th>
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<tr>
<td><strong>Internal Consistency</strong></td>
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<td>Extraversion</td>
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<tr>
<td>E1: Initiating-Receiving</td>
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<td>E2: Expressive-Contained</td>
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<td>E3: Gregarious-Intimate</td>
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<td>E4: Active-Reflective</td>
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<td>E5: Enthusiastic-Quit</td>
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**What These Conceptions Offer I/O Psychology**

As discussed, the Big Five’s ability to predict organizational outcomes has been firmly established, substantiating its value in I/O psychology. The nature of these five factors’ origin allows researchers to reasonably infer that they represent the overarching foundation of human personality. It follows that the soundness of this structure may lend the Big 5 to be an ideal starting point for identifying the existence of personality-related workplace outcomes. However, while its factor analytical roots cement the Big 5’s structure, it does not offer an inherent theoretical foundation for each factor (Block, 1995; Gurven, Rueden, Massenkoff, Kaplan & Vie, 2013), thus limiting its *explanatory* capabilities.

Jung’s conception of extraversion/introversion proposes that one’s attention and energy is dispositionally oriented inward or outward, leading the MBTI creators to craft items that indirectly tap this notion. As a result, assumptions regarding preferences and habits are intrinsic to one’s typology, and thus the MBTI conception of extraversion might be the ideal complement to the Big 5’s. For example, Demarst (1997) explains that when working in teams, an extravert is likely to speak up as soon as a thought/question is formulated, while someone of an introverted preference is likely to solidify an impression before speaking up. Additionally, introverted employees are likely to initially prefer working alone to solidify their ideas before thriving in a group environment; conversely, extraverted
employees are likely to flourish in a group environment as soon as a project is begun. Capitalizing on this, we believe I/O psychology may be able to use what distinguishes the MBTI’s extraversion from the FFM’s—its theoretical underpinnings—to garner a deeper understanding of how employees function in their workplace.

We believe the value of a Jungian conception to the field of I/O psychology is threefold: (a) its theoretical assumptions may be used to explain or clarify correlations that have been observed using the Big Five; (b) appealing to its theoretical roots, a Jungian conception may assist researchers in generating novel predictions related to personality in the workplace; and (c) the MBTI’s extraversion, as opposed to the Big Five’s, may explain more variance when used to predict outcomes that appeal to a Jungian conception. This paper attempts to demonstrate all three benefits.

**Applying a Jungian Perspective to the Workplace**

Extraversion from the FFM has been shown to predict success in occupations that demand the expression of extraverted behaviors (Barrick & Mount, 1991; Bartram, 2005). While a Jungian conception would support this logic, its organizational value may extend beyond simply what tasks extraverts and introverts favor, explaining additionally the types of workplace environments in which these individuals feel most comfortable. According to Jung, extraverts and introverts flourish when engaging in the external and internal environment, respectively. Therefore, the match between this personality type and the
occupation’s required tasks should predict organizational outcomes, but the match between degree of extraversion and the immediate work environment should do so as well. More specifically, if a work environment is characterized by a high level of external stimulation (e.g., noise, conversation, social interactions) it would, according to Jungian theory, be conducive for an extravert and taxing for an introvert. Conversely, a workplace of low external stimulation should be ideal for an introvert, but uncomfortable for an extravert. For the purpose of this study, we will refer to a work environment of high external stimulation as a “highly extraverted environment” and an environment of low external stimulation as an “introverted environment” or “low extraverted environment.”

Examining the fit of the employee to the work environment has long been of interest to organizational scientists. Conceptualized as person-environment (PE) fit, this research examines the degree to which the knowledge, skills, abilities (KSAs), and values of the employee match, or complement, the work environment, with evidence demonstrating a firm relationship to important outcome variables, such as performance and satisfaction (Su et al., 2015). However, despite the lengthy history of empirical attention, research on PE fit has not investigated fit involving the physical working environment. Our study aims to explore if an employee’s level of extraversion influences how well they fit into their physical work environment. If supported, this notion may have important implications, as it would allow organizations to be cognizant of a novel type of PE fit, while arming them with strategies that enable a work environment to be sensitive to the
psychological needs of a wide swath of employees. Extant research on PE fit and the physical work environment will be reviewed separately, before we present how extraversion can be incorporated into these two domains of research in a manner that previous research has yet to consider.

**Work Environment Fit**

Employee-environment fit has been a subject of substantial empirical inquiry over the last century, particularly in the field of management (Kristof-Brown, Zimmerman, & Johnson, 2005). In the context of the workplace, PE fit refers to the congruency between the individual and the environment in which he/she works, and this relationship has often been divided into five dimensions: (a) person-vocation fit (match between the person and the career interests associated with the vocation), (b) person-job fit (match between the person and the requirements of the job), (c) person-organization fit (match between the person and the culture and mission of the organization), (d) person-group fit (match between the person and his/her coworkers), and (e) person-supervisor fit (match between the person and his/her supervisor). Kristof-Brown et al. (2005) meta-analyzed four of these PE fits, all but person-vocation fit, observing that each one predicted job satisfaction (.44, .35, .24, and .35, respectively) and job performance (.16, .05, .15, .15) Notably, within the field of I/O psychology, these effect sizes for job satisfaction are considered large, reinforcing fit as a concept that may further explain important workplace outcomes. Additionally, most of the studies that have
examined more than one type of fit have reported unique predictions across fit type, adding merit to the current multidimensional approach (Kristof-Brown et al., 2005).

PE fit has been conceptualized in several ways. The most prevalent is Muchinsky and Monahan’s (1987) dichotomy of *supplementary fit*, in which an ideal match involves optimal similarity between person and environment, and *complementary fit*, in which an ideal match is not based on similarity, but rather mutually offsetting patterns. The latter fit has been recognized by researchers as attainable through *ability-demands fit* (when the environmental demands are met by the employee’s abilities) or by *needs-supply fit* (when the individual’s needs are met by the supplies of the environment; Kristof, 1996). These conceptualizations of PE fit have been used to better inform organizational decision-making. For instance, ability-demands fit has buttressed the logic behind personnel decisions, as organizations strive to fill jobs with appropriately skilled applicants, resulting in high levels of organizational efficacy, task performance, and group performance (Su et al., 2015). Needs-supply fit, on the other hand, has been linked to job satisfaction, as an employee’s needs describe values or preferences that when satisfied, typically translate to longevity within the organization (Su et al., 2015).

In addition to proposing various conceptualizations, PE fit researchers have compared and contrasted two operationalization strategies: explicit/objective measures and perceived/subjective measures (Su et al., 2015). Explicit measures, which have constituted the majority of measurement strategies, aim to collect data on the individual and the environment via separate sources. Fit is then inferred...
based on the discrepancy between these two data points, and represented as a single score. Conversely, subjective fit intends to measure employees’ judgment, prompting them to report their perception of how well they fit in with the environment, and thus conceptualizes fit as a psychological state. The prevailing notion within the PE fit research domain is that subjective fit is more indicative of workplace outcomes, particularly affective outcomes. Recent research has integrated objective and subjective, offering a model that conceptualizes subjective PE fit as mediating the relationship between objective PE fit and affective workplace outcomes (Yu, 2009).

For years, researchers used the terms perceived and subjective interchangeably when describing fit; however, Kristof-Brown et al. (2005) have distinguished these terms by explaining that perceived fit refers to methodology that asks participants to directly report how well they fit within the environment. On the other hand, subjective fit describes a methodological approach that prompts the employee to report their preference (P) and the state of the environment (E) separately; fit is then inferred based on the discrepancy. Therefore, perceived and subjective fit are similar in that a single employee either directly (one score) or indirectly (two scores) reports fit, whereas objective fit collects P and E data from separate sources. For the purpose of this paper, we ascribe to Kristof-Brown et al.’s distinction of perceived and subjective fit.

Due to the methodological nature of how subjective and perceived fit is collected, common-method bias has been a frequently proposed concern of this
research domain. Conscious or unconscious bias is likely to inflate the magnitude of effect sizes observed in studies that rely on a single source to determine fit. Yet in spite of these concerns, common method data collection has not always produced significantly larger effect sizes: Kristof-Brown et al. (2005) reported that relationships between subjective and objective fit measures of PJ fit and job satisfaction were .20 and .22, respectively. Regarding common method bias specific to PE fit and attitude relationships, research has suggested temporally separating data collection of these two measures to thwart illusory correlations (Podsakoff et al., 2003); however, this strategy has produced inconsistent results (Kristof-Brown et al., 2005). Some researchers have suggested that a single source should not be interpreted as erroneously inflating relationships, but rather revealing how employees are authentically experiencing their work environment. Regardless of the cognitive tendencies that influence one’s perception, it is, after all, this perception that determines the extent to which one is influenced (Endler & Magnussen, 1976).

Despite the emphasis on investigating various facets of PE fit, researchers have not conceptualized the physical environment as an element of the environment in which employees’ preferences may be significant. However, in spite of not being emphasized in the context of fit, the physical environment of the workplace has been the subject of substantial empirical inquiry.
The Physical Environment of the Workplace

Previous research efforts have firmly established that the physical environment is likely to influence employees’ job performance and job satisfaction. (Fisk & Rosenfeld, 1997; Veitch & Newsham, 1998; Mendis, 2016). This relationship has been observed in research, but it also appears that employees intuitively understand the importance of the physical work environment: A 2006 survey of United States employees revealed that 90% agreed that an office’s interior design affects the performance of its workers (Gensler, 2006), adding to the practical reasons why a thoughtful approach to the office layout should be a priority for organizations. Importantly, our review will present studies that examine the effects of the physical environment at the individual level, particularly on perceptions of job performance and job satisfaction. Some researchers have examined how team functioning is impacted by physical space (e.g., Allen, 1977; Bennis & Biederman, 199; Serrato & Wineman, 1999); however, this topic is outside the scope of this paper.

Most prominently, academic research in this domain has historically categorized the physical features of the office space as either traditional (characterized by confined surroundings such as cubicles or offices) or open-floor (characterized by a lack of interior walls; Davis, Leach, & Clegg, 2011). However, recently researchers have offered more specific categories. Our literature review revealed three broad categories: noise/social interactions, visuals (such as color, view, presence of plants), and ambience features (air quality/temperature).
Supporting the relevancy of these features, Veitch, Farley, and Newsham (2002) factor analyzed a measure of office environment satisfaction, revealing four factors which closely resemble the aforementioned categories: satisfaction with privacy, satisfaction with ventilation, satisfaction with lighting, and satisfaction with view. This review will present research on open/closed workspaces, in addition to these four categories of satisfaction.

**Open versus Traditional Offices**

Davis, Leach, and Clegg (2011) summarized research regarding the open versus traditional setup of the workplace, noting that open-floor plans, first and foremost, are known to decrease overhead costs, as fewer physical boundaries means less furniture. Yet aside from cost, research on open-floor plans has focused on their potential impact on employees. Open space has been suggested to facilitate greater communication among teams (Brookes & Kaplan, 1972), increased feedback among employees, and closer bonds among coworkers (Oldham & Brass, 1979). Some researchers have even proposed that a shift towards open floor plans has the capacity to symbolize the organization’s commitment to values such as collaboration and a lack of a rigid hierarchy (Brennan, Chugh, & Kline, 2002).

In spite of its potential benefits, research has also suggested that open-floor offices may carry inherent risk. For instance, a lack of interior walls predisposes employees to privacy concerns, resulting in less confidential discussion (Oldham & Rotchford, 1983) and more unavoidable, possibly undesirable social interactions (Davis, Leach, & Clegg, 2011). Regarding the disruptive nature of conversations,
Brill et al. (2001) reported that 29%, 52%, and 65% of employees working in single-room occupancies, double-room occupancies, and open-floor offices, respectively, reported being frequently interrupted by coworker conversations. Furthermore, and possibly most detrimental, there is the risk that open-floor plans could lead to cognitive overload due to excessive noise. The likely unavoidable increase in interruptions and distractions associated with an open workspace has been observed to induce lower levels of motivation (Oldham & Brass, 1979), decreased concentration (Oldham & Rotchford, 1983), and eventually compromised job performance (Barron, 1994). Regarding individual or contextual differences, researchers have found that managers/supervisors, as opposed to their subordinates, tend to be less comfortable with the inherent reduction in privacy of open offices (Carlopio & Gardner, 1992). Job characteristics may also moderate the physical environment’s effect on performance: Block and Stokes (1989) observed that complex tasks tended to be performed optimally in solitude, while repetitive tasks were performed best in a social setting. Lastly, Bergstrom, Miller, and Horneij (2015) longitudinally sampled 64 employees in a company that was moving from a traditional workspace to an open office. Over the course of one year, the employees reported significantly less perceived health, perceived performance, and perceived job satisfaction. Despite the majority of empirical findings observing detrimental effects of open-floor offices, the end of the 20th century witnessed a trend towards organizations embracing this style of interior design (Davis, Leach, & Clegg, 2011).
Privacy and the Physical Work Environment

Of the four factors observed from Veitch, Farley, and Newsham’s (2002) research on satisfaction with the work environment, privacy bears the most similarly with the previously reviewed section. Privacy, according to these authors, includes noise, visual privacy, social privacy, distractions, degree of workspace enclosure, control of work conditions, distance to others, and workstation size. Of office features relevant to privacy, noise has received the most empirical attention. White noise, as opposed to unmasked noise, has been shown to increase the performance of both complex and simple tasks (Loewen & Suedfeld, 1992). Additionally, a quiet working environment led to a significant improvement in mental arithmetic and on a memory task when compared to the background noise of an open work environment (Banbury & Berry 1998). Lastly, the presence of music and social conversation has been observed to increase errors in a serial recall task (Woolfgang & Hellbruck, 1998). Aside from just noise, Stokols, Clitheroe, and Zmuidzinas (1996) observed that foot traffic and visual exposure/visual distractions negatively predicted job satisfaction.

Ventilation and the Physical Work Environment

In accordance with Veitch, Farley, and Newsham’s (2002) analysis, ventilation refers to the quality of air and the temperature, and research has supported its importance. Mendis (2016) reported that employees perceive ventilation to significantly influence their performance. Poor air quality has also been associated with a decrease in the amount of time employees spend at work, as
it may lead to symptoms of poor health (Hall, Leaderer, Cain, & Fidler, 1991). Especially warm or cold temperatures have been shown to hinder employee performance (Oseland, 1999).

**Lighting and the Physical Work Environment**

Lighting, measured by Veitch, et al. (2002) as the amount and quality, has been reported by employees to be an important factor for optimal job performance (Mendis, 2016). Brill, Margulis, and Konar’s (1984) seminal publication on office design ranks lighting as the sixth most influential feature for employee productivity. The presence of proper lighting has also been demonstrated to predict a decrease in absenteeism (El-Zeiny, 2011), and researchers have recommended that organizations take advantage of both natural and artificial light to optimize employee performance (Mendis, 2016).

**View and the Physical Work Environment**

View according to Veitch, Farley, and Newsham’s (2002) analysis refers to one’s view of the outdoors. Scenic views have been suggested to have restorative abilities, particularly in a stressful working environment (Heerwagen, 1990). Moreover, the presence of a window near one’s workstation may be interpreted as a status symbol (Duffy, 1997). In addition to the location of windows, color has been a feature of the visual working environment that has received empirical attention, with many researchers positing that color schemes have the capacity to influence mood and thus productivity at work (Ainsworth, Cassell, & Simpson, 1993). Specifically, warm colors such as red have been observed to elicit arousal and
increase anxiety when compared to cool colors such as blue (Jacobs & Sales, 1997). Similarly, Kwallek, Soon, Woodson, and Alexander (2005) reported that participants in a red office reported lower levels of perceived performance and perceived job satisfaction than those working in a white office. Lastly, employees have reported the visual presence of plants to be important, even above privacy and noise (El-Zeiny, 2011).

**Extraversion, PE Fit, and the Physical Work Environment**

The research disciplines of management and I/O psychology have investigated work-environment fit and the physical work environment quite extensively over the last century; however, these two lines of research have yet to cross paths, as the physical characteristics of the environment in which one works have not been considered by scholars as a potential dimension of employee-environment fit. The divide between the physical environment and work-environment fit is surprising, as perhaps the most immediate and obvious characteristic of the environment is one’s physical surroundings. Considering the well-established relationship between PE fit and important workplace outcomes, it appears that deepening our understanding of how employees are affected by the fit of their environment is a worthwhile endeavor.

Despite the majority of PE fit research examining fit as involving relevant KSAs or values, some researchers have been interested in assessing the role of personality; however, the majority of these attempts focus on how personality predicts one’s value preferences. For example, Judge and Cable (1997) observed
that extraverted participants were more likely to prefer an aggressive culture. Specifically regarding PE fit, Ryan and Kristof-Brown (2003) state that personality’s stability and observable salience suggests it may be an important aspect of how the employee fits within the work environment, perhaps even more influential than the common approach of examining value-fit. In response to this statement, we offer groundwork by which extraversion may be considered within each of the three prevailing conceptualizations of PE fit: supplementary fit, demands-abilities fit, and needs-supply fit. First, extraversion as supplementary fit and demands-abilities fit are offered as theoretical considerations. Next, the influence of extraversion and the physical work environment are synthesized according to a needs-supply perspective, which this paper intends to empirically examine.

**Extraversion as Supplementary Fit**

PE fit has been conceptualized as supplementary when fit of the employee and the environment increases according to a given similarity. Within the domain of PE fit research, the similarity of interest has predominantly been values, described as value congruence (Cable & Edwards, 2004), and this type of fit has been observed to affect not only affective outcomes such as job satisfaction (Su et al., 2015), but also interpersonal relationships (Kallith, Bluedorn, & Strube, 1999). We believe that employees may often desire supplemental fit in terms of extraversion, particularly in the subdomain of person-group fit, which evaluates the extent to which employees fit with their coworkers. Quality relationships with
coworkers have been observed to significantly predict job satisfaction, organizational commitment, and turnover (Reich & Hershcovis, 2010).

Interestingly, people are more likely to befriend others with similar extraversion levels (Back, Schmukle, & Egloff, 2011); therefore, it seems reasonable to assume that the degree to which one’s extraversion fits the extraversion of his/her coworkers may influence important workplace outcomes. In further support of this notion, research has observed a main effect between extraversion and job satisfaction, yet this relationship was strengthened when the work environment was characterized as highly interpersonal (Haung et al., 2015).

In an effort to explain the mechanisms responsible for PE fit, scholars have often cited the Attraction-Selection-Attrition (ASA) model (Schneider, 1987), which stipulates that organizations become progressively homogenized through the processes by which job candidates are attracted to the organization, selected or hired by the organization, and decide to stay or leave the organization (Su et al., 2015). The ASA model could also explain extraversion in terms of desired supplementary fit, as researchers have found that coworkers’ personalities are notably similar (Schneider, Smith, Taylor, & Fleenor, 1998; Bradley-Geist & Landis, 2012).

**Extraversion as Abilities-Demands Fit**

Conceptualized as one of two types of complementary fit, abilities-demands fit measures the extent to which the KSAs demanded from a given occupation are present in an employee. For example, a successful public speaker must be
charismatic, an English professor should have strong verbal intelligence, and a therapist requires high emotional intelligence. Perhaps the most intuitive type of fit, ability-demands fit approximates an employee’s task performance (the technical core of one’s job), and research efforts have demonstrated its link to productivity (Su et al., 2015). Therefore, this type of fit can be used to conceptualize extraverted behaviors as an ability that is required by certain occupations, and despite not using the term “ability-demands,” this is precisely what research on extraversion and job performance has discovered. Barrick and Mount (1991) examined personality’s prediction of job performance across five occupational groups—professionals, police, managers, sales, and semi-skilled/unskilled jobs—correctly hypothesizing extraversion’s prediction of performance for sales and managers. Vinchur, Schippman, Switzer, and Roth (1998) specifically meta-analyzed personality and sales performance, reporting that extraversion predicted not only supervisor ratings in this occupation, but also objective metrics of sales performance. These findings support the notion that jobs that require sociability, gregariousness, and ambition are likely to demand the expression of extraversion (Barrick & Mount, 2005). Furthermore, conceptualizing extraversion through an ability-demands fit perspective can be explained by the theory of work adjustment (Dawis & Lofquist, 1984), a model that researchers have commonly applied to PE fit, which stipulates that employees are likely to adjust their occupation (by tweaking their existing job or finding a new one) to create a match between their abilities and those that are required, leading to enhanced performance and satisfaction.
Extraversion as Needs-Supply Fit

Conceptualized as the second of two types of complementary fit, needs-supply fit describes the degree to which the needs of the employee are supplied by the environment in which he/she works. This type of fit has primarily examined goals, desires, and values as employee needs, prompting some scholars to refer to this subset of research as psychological needs fulfillment (Cable & Edwards, 2004). Yet beyond these frequently studied constructs, we believe that I/O research has yet to consider the psychological needs that are explained by a Jungian conception of extraversion. According to Jung, an individual’s level of comfort is, in part, a reflection of the extent to which the environment allows one’s attention to be congruent with his/her preferred orientation, that being externally or internally focused. While extraverts can excel in introverted activities/environments (and introverts in extroverted activities/environments), there is a threshold, as involvement with one’s less preferred orientation requires expending energy (Jung, 1971). Chronic overindulgence, according to Jung, will result in restlessness and dissatisfaction (Jung, 1971).

On the surface, this may be interpreted to suggest that workers have an underlying desire to seek an occupation in which the primary tasks are congruent with their dispositional inward or outward orientation. For instance, a writer’s primary task requires an inward focus, while a firefighter’s primary task requires an outward focus and, in fact, this is consistent with Jung’s theory of extraversion. However, examining the match between the employee and an occupation’s required
tasks would hardly be considered novel within the domain of PE fit research, as person-vocation fit has investigated this relationship, despite not appealing to Jungian theory for support. Furthermore, one’s momentary task does not solely dictate the extent to which an individual is oriented internally or externally, but rather the immediate environment may also have substantial influence. Consider an introverted writer attempting to work in an open-office space with heavy traffic. While the primary task may be congruent with the writer’s internal disposition, the externally stimulating environment may tax the introvert in a manner that detracts from the ability to fully indulge his/her inner world. Applied to a needs-supply perspective, the employee has a psychological need to favor his/her preference for external or internal orientation and the physical workplace supplies the environment that either facilitates or hinders this disposition. This study attempts to demonstrate the psychological needs of extraversion according to a needs-supply conception of PE fit. In the process, we not only consider Kristof-Brown et al.’s (2005) recommendation to examine personality within the domain of PE research, but also respond to their statement that this area of research should strive to discover its cognitive underpinnings by proposing Jungian theory as the theoretical backbone by which extraversion influences fit.

**Summary and Hypotheses**

As explained previously, the conceptual differences between a Jungian and FFM approach to extraversion allow Jungian-based measures to generate predictions beyond the scope of what a purely factor analysis-based measure can
offer. Often believed to be psychometrically deficient, we hope to have offered compelling evidence for the psychometric quality of the MBTI’s extraversion, demonstrating that when it is parsed out from its three counterpart dimensions, its reliability and validity rivals that of the FFM’s.

In addition, we briefly reviewed the extant literature on PE fit and the physical work environment separately, specifically offering evidence of the well established relationship between these predictors and job performance and job satisfaction. As the purpose of this paper is to demonstrate the value of a Jungian conception, we attempt to demonstrate how extraversion may influence a novel facet of PE fit by measuring how employees fit within the physical work environment.

This study measured participants across four variables: extraversion, PE fit, perceived job satisfaction, and perceived job performance. First, participants will be administered the extraversion items of the IPIP-NEO and the MBTI, representing a factor analysis conception and a Jungian conception, respectively. Next, pictorial vignettes of workplace environments varying in external stimulation were presented (these vignettes were rated on external stimulation by a separate group of SMEs prior to data collection). Participants were asked to indicate PE fit, perceived job satisfaction, and perceived job performance for each vignette. Given that each participant viewed a series of vignettes, the within-person relationship between extraverted environment (i.e., external stimulation rating) and PE fit was observed. If Jungian theory applies to the workplace as expected, extraversion, as
measured by the MBTI, should predict this within-person relationship, such that higher levels of extraversion should predict better fit in more stimulating environments.

**Hypothesis 1a**: Extraversion from the MBTI will positively predict the within-person relationship between extraverted environment and PE fit.

Although the MBTI and the FFM differ in their conceptions of extraversion, both versions of this construct share inherent similarities. In fact, some authors have suggested that the extraversion factor of these measures can be used interchangeably (McCrae & Costa, 1989). We therefore expect the FFM’s extraversion to also predict the within-person relationship, such that higher levels of extraversion should predict better fit in more stimulating environments. This study uses the IPIP-NEO, a measure that was constructed to effectively replicate Costa and McCrae’s NEO-PI-R.

**Hypothesis 1b**: Extraversion from the IPIP-NEO will positively predict the within-person relationship between extraverted environment and PE fit.

Although we predict both versions of the extraversion construct to predict this relationship, we expect the MBTI’s predictive ability to be superior. As previously explained, the MBTI’s extraversion dimension has been designed and refined over several decades to represent Jung’s theory that people have an innate tendency to prefer internal or external stimulation, leading them to gravitate towards and feel more comfortable in an environment that facilitates their preference. The workplace environment vignettes vary in the amount of physical,
auditory, and social stimulation present; therefore if Jungian theory applies to the workplace as we expect, extraversion according to the MBTI should predict employees’ perception of fit more accurately than any other measure of extraversion, as its unique approach to item writing was adopted to specifically represent this notion.

**Hypothesis 1c**: Extraversion from the MBTI will positively predict the within-person relationship between extraverted environment and PE fit over and above extraversion from the IPIP-NEO.

Previous research on needs-supply PE fit has demonstrated that it positively predicts job satisfaction and job performance (Kristof-Brown et al., 2005). This study offers a novel facet of fit by predicting that the characteristics of the physical work environment may qualify as a supply that meets a need that differs across employees. Given this, we predict this type of needs-supply fit will influence job performance and job satisfaction similar to past research on employee needs.

**Hypothesis 2**: There will be a positive within-person relationship between PE fit and perceived performance.

**Hypothesis 3**: There will be a positive within-person relationship between PE fit and perceived satisfaction.

**Method**

**Participants**

Participants for this study were recruited from www.mturk.com. Due to this study’s interest in employee perceptions, participants were required to be 18 years
of age or older, currently working full time (minimum of 35 hours a week), and reside in the United States. Regarding sample size and multi-level interactions, Mathieu, Aguinis, Culpepper, and Chen (2012) calculated an estimate of statistical power in designs with a level 1 sample size of 3, 5, 7, and 18 across level 2 sample sizes between 20 and 115, observing that level 1 samples of 3, 5, and 7 failed to reach a statistical power of .40 even when level 2 samples reached 115. On the other hand, when the level 1 sample reached 18, power exceeded .80 with a level 2 sample of 35, and .95 with a level 2 sample of 60. The current research involved a level 1 (vignette) sample of 18 and a level 2 (individuals) sample of 110 and thus should have sufficient power (these samples are described more below).

The Mturk survey received 130 hits (or responses). Through the process of data cleaning, 20 responses were removed: 1 participant did not consent, 5 failed at least one out of three attention check items, 13 did not complete the MBTI, and 1 participant completed the survey twice. Participants’ completion time was examined and checked for outliers; no individuals were removed based on completion time. The final sample consisted of 110 participants with mean age of 35.47 years (SD = 18.5 years, range = 19-70 years). The sample was 59.1% male and included Caucasian (76.4%), African-American (10.0%), Asian (9.1%) Hispanic (3.6%), and mixed race (0.9%) participants. The most common occupational families were computer and mathematics (21.8%), sales (18.2%), office and administrative support (10.0%), and education, training, and library (10.0%). Participants were paid $4.50 for completing the survey.
Measures

The following measures, aside from the extraversion measures, were selected using the following criteria: (a) appropriateness of the construct and (b) fit of item wording when applied to pictorial vignettes. The latter criterion was used to minimize the number of adaptations necessary. The original measures, our adaptations, and corresponding justifications are presented in Appendix A.

Extraversion

Participants were administered the MBTI Form-Q, including the 36 extraversion items (alpha = .93; Schaubhut & Herk, 2009) and the 24 extraversion items of the IPIP-NEO (alpha = .92; IPIP.org). The corrected correlation between the NEO-PI-R and the IPIP-NEO is reported to be .98 (IPIP.org), and its high convergence across all five factors has led many researchers to use the IPIP-NEO (e.g., Lucas, Diener, Grob, Suh, & Shao, 2000). Scores were calculated in accordance to each measure’s protocol.

Extraverted Environment

The extraverted environment, according to this study, refers to the amount of external stimulation present in the physical work area. This was operationalized using SME ratings of pictorial vignettes of workstations. The initial set of 24 pictures shown in Appendix B was chosen in an effort to control for extraneous themes that could influence participants’ ratings (e.g., style of furnishing). In addition, these pictorial vignettes were selected and/or edited to control for each of the aforementioned physical environment categories that could be visually detected.
in an effort to avoid confounding our results with variables that have been shown to influence employee satisfaction and performance. Specifically, pictures were edited to remove color, outdoor windows, and differences in lighting.

SME ratings were used to operationalize extraverted environment and to narrow down the pictorial vignettes used in the study. More specifically, 6 SMEs (I/O psychology graduate students) rated the level of extraversion represented in each picture. Extraverted environment was calculated by averaging six adapted items from Veitch et al.’s (2002) Environmental Features Ratings (EFR). This measure contains a satisfaction with privacy sub factor. This factor (10 items, internal consistency = .89), measures visual privacy, social privacy, distractions, degree of workspace enclosure, control of work conditions, aesthetics, distance to others, and workstation size. A close inspection of these items revealed that 6 of the 10 items ask respondents to indicate the level of stimulation present in the work environment from one or more sources: physical, auditory, or social. The six SMEs were asked to respond to these 6 items across each vignette, with the mean score representing the composite measure of extraverted environment for each vignette (Table 1).

To further control for variables that may influence participants’ responses, SMEs were also asked to indicate how physically comfortable the environment appeared (1 [very uncomfortable] – 5 [very comfortable]) and how visually attractive the environment appeared (1 [very unattractive] – 5 [very attractive]). Attractiveness and comfort ratings were averaged together to form a composite of
general appeal for each vignette. Additionally, the SMEs were prompted to indicate if any of the pictures contained notably distinguishing features that might influence participant responses by describing them in a text box corresponding to each of the vignettes.

Vignettes were eliminated if they met any of the following criteria: (a) composite of general appeal was below 2.0, (b) the standard deviation of the extraverted environment was 1.0 or greater, or (c) two or more participants responded with a similar comment in the text box associated with each vignette. Vignettes 3, 4, 5, 7 and 8 were eliminated (Table 1), narrowing the level 1 N size to 18 vignettes (Appendix C).

**PE Fit**

Beasley, Jason, and Miller’s (2012) General Environment Fit Scale (alpha = .81) contains a three-item subscale measuring needs-supply fit (alpha = .71). Because this study conceptualizes fit of extraverted environment as a needs-supply fit, these three items were adapted and their mean score represented PE fit.

**Perceived Job Satisfaction**

A single-item measure of job satisfaction that has demonstrated comparable reliability and validity to multi-item measures was administered: this item has shown a .82 correlation with Warr, Cook, and Wall’s (1979) 15-item Job Satisfaction Scale (Dolbier, Webster, McCalister, Mallon, & Steinhardt, 2005).
Perceived Job Performance

Two of four items from a previously adapted measure of job performance were used (Chernikova, Lo Destro, Mauro, Pierro, Kruglanski, & Higgins, 2015). Both items were adapted, and perceived job performance was be calculated by computing the mean of these items.

Procedure

Mturk.com is a website that allows “requesters” to upload a task, or series of tasks (often research based), and “workers” are then monetarily compensated for completing these tasks. Our study was available on Mturk until we reached 130 respondents. Participants were first presented with the IPIP-NEO’s extraversion items. Next, participants responded to vignettes according to PE fit, perceived job satisfaction, and perceived job performance. More specifically, in accordance with the recommendations of Kristof-Brown, Zimmerman, and Johnson (2005) to reduce the effects of common method bias, each of the vignettes appeared three times. Participants rated PE fit during the first viewing, perceived job satisfaction during the second viewing, and perceived job performance during the third viewing. Last, a link was provided, along with a username and password, allowing participants to access a website that administered the MBTI.

Results

Descriptive statistics and correlations (Table 2) were calculated for each of the five major variables: IPIP extraversion, MBTI extraversion, PE fit, perceived performance, and perceived satisfaction. All alphas were acceptable, ranging from
MBTI alpha was not able to be calculated, as the CPP distributors do not disclose the scoring method of this instrument. These variables were inspected in terms of frequencies and outliers; no additional individuals were removed based on this analysis. Before hypothesis testing, intraclass correlation coefficients were calculated for each of the dependent variables to determine the amount of within person variance. Results indicated that 70%, 54%, and 71% of the variance for PE-fit, perceived performance, and perceived satisfaction, respectively, was observed to be within-person.

Hypothesis 1a stated that extraversion from the MBTI will positively predict the within-person relationship between extraverted environment and PE-fit. This was tested by specifying a level-1 model with extraverted environment as the predictor and PE-fit as the outcome, and a level-2 model with MBTI extraversion as the predictor of the level-1 slope. Results demonstrated a significant relationship ($b = .006, p < .05$; Table 3). MBTI extraversion’s influence on the relationship between extraverted environment and PE-fit is visually represented in Figure 1. As depicted in the figure, as the amount of stimulation in the environment increases, the reported PE fit decreases for both those low and high in extraversion; however, this decrease is stronger for those low in extraversion.

Hypothesis 1b stated that extraversion from the IPIP will positively predict the within-person relationship between extraverted environment and PE-fit. Again, this prediction was tested by specifying a level-1 model with extraverted environment as the predictor and PE-fit as the outcome, and a level-2 model with
IPIP extraversion as the predictor of the level-1 slope. Results did not demonstrate a significant relationship ($b = 1.1, p = .13$; Table 4). Therefore, Hypothesis 1b was not supported.

Hypothesis 1c stated that extraversion from the MBTI will positively predict the within-person relationship between extraverted environment and PE fit over and above extraversion from the IPIP-NEO. A level-1 model was specified with extraverted environment as the predictor and PE-fit as the outcome, and at level-2, MBTI extraversion and IPIP extraversion were both added as predictors of the level-1 slope. Results did not indicate a significant relationship ($b = .005, p = .21$; Table 5), and thus Hypothesis 1c was not supported.

Hypothesis 2 stated that there will be a positive within-person relationship between PE fit and perceived performance. A level-1 model was specified with PE fit as the predictor and perceived performance as the outcome. Results demonstrated a significant relationship ($b = .870, p < .01$; Table 6); thus, Hypothesis 2 was supported.

Hypothesis 3 stated that there will be a positive within-person relationship between PE fit and perceived satisfaction. A level-1 model was specified with PE fit as the predictor and perceived satisfaction as the outcome. Results demonstrated a significant relationship ($b = 1.010, p < .01$; Table 7); thus, Hypothesis 3 was supported.
Discussion

After almost a century of refinement, the Big 5 has emerged as the crowning achievement in personality research, demonstrated by its nearly universal preference among researchers in academic literature. I/O psychology research is no exception, as the precedent over the last few decades has increasingly been to rely on the Big 5 in our empirical investigations. Yet, perhaps incidentally, our trend towards this reliance has resulted in what some may consider a myopic perspective, as our understanding of personality in the workplace has been buttressed, almost exclusively, by a taxonomic representation of personality. As a result, the vast majority of our studies on personality share common limitations that characterize taxonomic approaches. The goal of this study was to examine the value of the theoretically based, Jungian conception of extraversion by showing its relevance to how employees fit into the physical environment of the workplace, and thus the unique value of what a theoretically based personality measure may offer our field.

PE fit refers to the match between the individual and the work environment (Kristof-Brown, Zimmerman, & Johnson, 2005). Research has historically conceptualized types of PE fit as supplementary, ability-demands, and needs-supply, with each type predicting unique workplace outcomes (Su, 2015). This study considered the influence of a Jungian conception of extraversion in the workplace by proposing it as relevant to needs-supply fit, suggesting that Jung’s notion of preferring internal or external orientation will manifest as a need of the employee. The physical environment in which one works was proposed to act as
the supply capable of providing resources necessary to meet the employee’s needs, in this case the amount of preferred external stimulation in the immediate work environment. Hypothesis 1a and 1b addressed this notion focusing on the MBTI and IPIP-NEO, respectively, as it was hypothesized that highly extraverted employees would report fitting better in stimulating environments than their less extraverted counterparts. Additionally, the MBTI, due to its grounding in Jungian theory, was hypothesized to predict this relationship over and above the NEO-IPIP. Lastly, PE fit was hypothesized to predict perceived performance and perceived satisfaction.

**Findings**

Support was found for Hypothesis 1a, as extraversion from the MBTI positively predicted the within person relationship between extraverted environment and PE fit. This means that participants with higher MBTI extraversion scores were more likely to report a higher level of PE fit in more stimulating environments compared to less extraverted participants. However, a close inspection of the results reveals that an increase in the amount of external stimulation in the environment predicted a decrease in PE fit even in participants with high MBTI extraversion. Nonetheless, the findings indicate that participants low in MBTI extraversion were likely to report even less PE fit than their more extraverted counterparts when presented with work environments high in external stimulation. In effect, participants with high and low MBTI extraversion scores reported better fit in less stimulating environments; however, the preference
towards less stimulating environments increases as MBTI extraversion decreases, and this trend is graphically represented in Figure 1. This finding is congruent with the general consensus that has emerged from physical workplace environment studies suggesting that more open, stimulating workplaces lead to a myriad of problems such as lower motivation (Oldham & Brass, 1979), concentration (Oldham & Rotchford, 1983), and even job performance (Barron, 1994).

Hypothesis 1b addressed the same notion but focused on extraversion according to the IPIP-NEO as the predictor of the within person relationship between extraverted environment and PE fit. However, this hypothesis was not supported. The lack of significance may reflect the difference between a taxonomic and a Jungian derived conception of extraversion, but interpreting this is difficult, as our failure to observe a significant relationship does not guarantee that there is no effect.

The proposed relationship between extraverted environment and PE fit stemmed from our consideration of how Jung’s theory of preferring to be internally or externally orientated might become influential to workplace outcomes. We therefore expected that extraversion according to a measure designed to encapsulate Jung’s theory, in this case the MBTI, would predict this relationship over and above extraversion from a taxonomic conception, represented in this study by the IPIP-NEO. However, the data did not support this prediction (Hypothesis 1c), suggesting that the two measures shared enough variance to account for a similar pattern among participant responses. Note that it is not clear that this result is
simply due to low power. Based on findings from Mathieu et al. (2012), the current sample sizes for Level 2 (110) and Level 1 (18) likely provide sufficient power to detect a notable effect. Thus, additional research may be helpful in uncovering the factors responsible for this pattern of results.

Hypotheses 2 and 3 stated that there would be a positive, within-person relationship between PE fit and perceived performance and perceived satisfaction, respectively. Both predictions were supported, meaning that when a participant identified a work environment as high in fit, they were also more likely to identify this work environment as facilitating their performance and satisfaction. Conversely, the lower a participant rated the fit of an environment, the lower they rated their expected performance and satisfaction in that same environment. This observation is congruent with previous research that has found PE fit predicts performance and satisfaction (Kristof-Brown et al., 2005).

**Implications for Research**

We believe the support demonstrated for Hypothesis 1a has implications for future research involving extraversion in our field. The notion that stimulating environments may impact employees differently, depending on their level of extraversion, in part, demonstrates our effort to generate a prediction rooted in Jungian theory that may be outside the range of what a taxonomic representation of extraversion can explain. Likewise, we believe that extraversion as a tendency to focus internally or externally is distinct enough from taxonomic representations of extraversion that it may be viewed as an opportunity for researchers to consider
how other conceptions of personality may complement the typical Big 5 perspective.

Second, we hope that through our review of the literature and the support observed for Hypothesis 1a, that we may have strengthened the case for the MBTI to be considered as a viable instrument in I/O psychology research. Although some criticisms of this instrument are difficult to deny, such as its refusal to depart from a typology approach or its questionable reliability, these weaknesses can be addressed. When a single dimension such as extraversion is studied in isolation from the remaining three dimensions, its reliability may be just as strong as what is commonly reported for the FFM (Schaubhut & Herk, 2009). Furthermore, when researchers use continuous scores to represent the MBTI’s dimensions, which is common in MBTI research (Myers & McCaulley, 1985), concerns regarding the typology approach are bypassed as well. This research, along with previous studies, have used these strategies to garner the advantages of what this measure offers without the liabilities highlighted by the critiques often cited in personality literature.

Lastly in regards to the MBTI, this study aimed to demonstrate its superior ability to support a Jungian generated hypothesis. However, the findings do not fully support this notion, as the MBTI did not predict the within person relationship between extraverted environment and PE fit over and above the NEO-IPIP. In other words, the MBTI’s unique variance, unaccounted for by the NEO-IPIP, did not significantly impact the relationship between extraverted environment and PE fit.
On the other hand, there is some tentative evidence for this claim in that the MBTI (Hypothesis 1a) was demonstrated to be a significant predictor of this relationship while the NEO-IPIP (Hypothesis 1b) was not. Future studies may wish to investigate if or when the MBTI is more predictive of workplace outcomes compared to the Big 5.

Regarding PE fit, this study contributes to extant literature by incorporating Kristof-Brown et al.’s (2005) recommendation that research should consider examining personality’s role in influencing PE fit. In doing so, this is the first study to our knowledge that suggests that personality may have a central role in impacting a needs-supply conception of PE fit. Moreover, we also attempted to respond to their call to focus on the mechanisms underlying PE-fit by offering Jungian theory as an explanation as to why some employees fit better than others depending on the work environment.

Finally, this study contributes to research, as it is the first study to our knowledge that combines two research domains that have historically remained separate: the physical work environment and PE fit. This study suggests that the physical characteristics of a work environment may act as the “supply” in a needs-supply conception of PE fit, while extraversion dictates the “needs” of the employee. This is suggested by our observation that employees low in extraversion reported a greater need for less stimulating environments, indicated by lower scores on an adapted needs-supply scale than their more extraverted counterparts.
Implications for Practice

Over the last few decades, personality measures have been most often used in organizations to predict performance (Hurtz & Donovan, 2009). As a practitioner tool, this often means incorporating the Big 5 into selection batteries due to the incremental validity that personality has been shown to have over cognitive ability (Schmidt & Hunter, 1998). We believe the results of this study diverge from this trend. Instead of personality’s prediction of performance, we demonstrated how employees’ physical environment influences PE fit depending on their personality, which ultimately impacted their perceived performance.

Additionally, this study begins to offer evidence that extraversion, as a construct, may differ according to the MBTI and Big 5 to a degree that offers an opportunity in applied settings. As described in the literature review of this paper, a taxominic measure of extraversion may be preferable in predicting extraverted behaviors, and thus performance in occupations that demand them, like sales. A Jungian conception, on the other hand, may be more appropriate in determining the social and environmental preferences of employees, as suggested by this study’s observation that Jungian extraversion predicted the preference of environments while a taxominic approach did not.

Our data also suggest that regardless of level of extraversion, employees believed that they would fit better, perform better, and be more satisfied in environments with less external stimulation. Therefore, we recommend that organizations reconsider the trend towards open office spaces and consider the
benefits of a less stimulating workplace. Furthermore, our results revealed that less extraverted employees appeared to be more sensitive of the deleterious effects of a stimulating work environment compared to employees high in extraversion. As a result, organizations in fields that specifically attract introverted employees, such as information technology careers (Lounsbury, Moffitt, Gibson, Drost, & Stevens, 2007), should especially consider the ramifications of how a stimulating work environment may impact their employees.

**Limitations and Future Research**

There are a few notable limitations of this research. First, PE fit studies that have examined performance and satisfaction usually inquire about an employee’s current job, rather than a hypothetical situation. In asking participants to respond to vignettes, we trusted in their ability to quickly and accurately decipher the extent to which the work environments would impact their fit, performance, and satisfaction. As a result, the support for our conclusions should not be considered definitive.

Second, when reporting fit, performance, and satisfaction, participants viewed the same vignette three separate times; therefore, it is possible that the initial impression/response to the vignette influenced the impression formation of the second and third viewing of the same vignette. In an attempt to mitigate the effects of previous impression formation, we used a relatively large number of vignettes (18) and randomized the order in which they were presented. Nonetheless, this issue may have influenced the results.
Third, we did not specify the type of task the participants would be working on when estimating their fit, performance, and satisfaction across the 18 work environments. It is possible that some participants could have been imagining how the tasks unique to their current employment would be impacted in each of the workplaces. Additional analysis may reveal a pattern across occupations capable of indicating whether this may have been the case; however, further investigation would be needed. Additional analysis may reveal a pattern across occupations capable of indicating whether this may have been the case; however, further investigation would be needed. Likewise, the structure of many of the workplaces that were presented, in addition to the tasks the employees in the vignettes appear to be doing, may have prompted some of the participants to assume that they would be performing an extroverted or introverted activity if placed in that work environment. Finally, it should be noted that fit, satisfaction, and performance were all self-reported measures and are thus subject to common method bias.

We recommend that future research consider how a Jungian conception of personality may offer value to I/O psychology research, not only in terms of generating predictions of workplace phenomena, but also in considering the use of Jungian based measures when collecting data. Future research may also want to investigate when or if the MBTI is more predictive than the Big 5. To this end, we encourage researchers to focus on the ways in which these measures differ. In particular, studies might consider the emphasis the MBTI places on introspection, a divergence that some researchers have suggested may be a mistake on the part of
MBTI authors (e.g. McCrae & Costa, 1989). We also recommend that future research on PE fit consider how the physical environment may influence additional employee outcomes, and not solely as a needs-supply fit, but potentially as a supplementary fit as well.

**Conclusions**

The present study examined the value of a Jungian conception of personality by using the MBTI to predict the relationship between the work environment and PE fit. We hope to have offered researchers with an example of how a Jungian conception of extraversion may provide insight on how employees function in the workplace, and in doing so, inspire future investigation into how a Jungian perspective of personality may complement the taxonomic approach that has dominated I/O psychology research.
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<th>Visual Attractiveness</th>
<th>Physical Comfort</th>
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<td>SD</td>
<td>M</td>
</tr>
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<td>1.</td>
<td>4.3</td>
<td>.50</td>
<td>2.6</td>
</tr>
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<td>.54</td>
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</tr>
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</tr>
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<td>18.</td>
<td>4.7</td>
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<td>24.</td>
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<td>.36</td>
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Note. Vignette 3, 5, 7, and 8 were eliminated due to attractiveness and comfort average of < 2.0. Vignette 4 was eliminated due to high standard deviation of extraversion rating.
Table 2

Descriptive Statistics and Correlations

<table>
<thead>
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<th>Variables</th>
<th>M</th>
<th>SD</th>
<th>ICC</th>
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<th>5</th>
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<td>2. MBTI Extraversion</td>
<td>22.82</td>
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<td>3. PE Fit</td>
<td>2.78</td>
<td>0.80</td>
<td>.70</td>
<td>.25**</td>
<td>.25**</td>
<td></td>
<td></td>
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<td>4. Performance</td>
<td>6.21</td>
<td>1.53</td>
<td>.54</td>
<td>.27**</td>
<td>.21*</td>
<td>.55**</td>
<td></td>
<td></td>
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<tr>
<td>5. Satisfaction</td>
<td>3.84</td>
<td>1.08</td>
<td>.71</td>
<td>.29**</td>
<td>.24*</td>
<td>.88**</td>
<td>.65**</td>
<td></td>
</tr>
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* p < .05.  ** p < .01.
Table 3

Hypotheses 1a: Extraversion from the MBTI will positively predict the within-person relationship between extraverted environment and PE fit

<table>
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<th>df</th>
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</thead>
<tbody>
<tr>
<td>Intercept</td>
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<td>.085</td>
<td>-8.06**</td>
<td>108</td>
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<td>MBTI Extraversion</td>
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<td>2.00*</td>
<td>108</td>
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</tbody>
</table>

* p < .05. ** p < .01.
Table 4

*Hypotheses 1b: Extraversion from the IPIP-NEO will positively predict the within-person relationship between extraverted environment and PE fit*

<table>
<thead>
<tr>
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<td>Intercept</td>
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<td>.243</td>
<td>-3.75**</td>
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<td>IPIP Extraversion</td>
<td>.110</td>
<td>.072</td>
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<td>108</td>
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</table>

**p < .01.**
Table 5

Hypotheses 1c: Extraversion from the MBTI will positively predict the within-person relationship between extraverted environment and PE fit over and above extraversion from the IPIP-NEO

<table>
<thead>
<tr>
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<td>Intercept</td>
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<td>IPIP Extraversion</td>
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* p < .05.
Table 6

Hypotheses 2: There will be a positive within-person relationship between PE fit and perceived performance

<table>
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<td>PE-Fit</td>
<td>.870</td>
<td>.045</td>
<td>19.16**</td>
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** p < .01.
Table 7

Hypothesis 3: There will be a positive within-person relationship between PE fit and perceived satisfaction

<table>
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<td>PE-Fit</td>
<td>1.010</td>
<td>.031</td>
<td>32.69**</td>
<td>109</td>
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</table>

**p < .01.
Appendix A

Extraverted Environment

**Original Measure:** Satisfaction with Privacy factor, from Environmental Features Rating, Veitch, Farley, and Newsham (2002). Factor loadings are indicated in parentheses.

Amount of noise from other people’s conversations .79 (noise/social)

Frequency of distractions from other people .72 (social)

Degree of enclosure of your work area by walls .70 (physical)

Level of visual privacy within your office .69 (physical)

Distance between you and other people you work with .69 (social/physical)

Level of privacy for conversations in your office .66 (social)

Amount of background noise (i.e. not speech) you hear at your workstation .65 (noise)

Size of your personal workspace to accommodate your work, materials, and visitors (.56)

Your ability to alter physical conditions in your work area .52

Aesthetic appearance of your office .49

**Directions:** none included

**Response scale:** 1 (very unsatisfactory) -7 (very satisfactory)

**Adapted Measure:** The six items selected refer directly to external stimulation or features in the environment that could facilitate or hinder external stimulation. Parentheses include our categorization of stimulation source.

High amount of noise from other people’s conversations (noise/social)

High frequency of distractions from other people (social)

High degree of enclosure of your work area by walls (physical)
High level of visual privacy within your office (visual)

Large distance between you and other people you work with (social/physical)

High amount of background noise (i.e. not speech) you hear at your workstation (noise)

**Adapted direction:** “Please rate from 1 (not at all true)-7 (very true) the degree to which each of the following statements applies to the following work environments

**PE Fit**

**Original Measure:** Needs-supply subscale, from General Environment Fit Scale, Beasley, Jason, and Miller (2012). Inter-item correlations are indicated in parentheses.

This setting fulfills my needs (.53)

There is a poor fit between what this setting offers me and what I need in a setting (.77)

The setting that I action in does not have the attributes that I need in a setting (.78)

**Directions:** “The items below ask about how well the setting you currently action in matches your values, needs, abilities, and characteristics. Please circle the number to indicate how much you agree or disagree with each statement.”

**Response scale:** 1 (strongly disagree) – 4 (strongly agree)

**Adapted measure:**

This setting fulfills my needs

There is a poor fit between what this setting offers me and what I need in a setting

This setting does not have the attributes that I need in a setting

**Adapted directions:** “The items below ask about how well the setting matches your needs. Please select the number to indicate how much you agree or disagree with each statement. Please glance at each of the pictures before beginning your response so that you have a reference of comparison.” (Since we are only interested in the needs-supply subscale, values, abilities, and characteristics were removed from the directions.)
Adapted response scale: 1 (strongly disagree) – 5 (strongly agree). A mid point of “neither agree or disagree” was added so participants were not forced to indicate good or poor fit.

Job Satisfaction

Measure: Job satisfaction, Dolbier et al. (2005).

“Taking everything into consideration, how do you feel about your job as a whole?”

Directions: none included

Response scale: 1 (extremely dissatisfied) – 7 (extremely satisfied)

Adapted directions: Please indicate how you would anticipate responding to this question assuming that this was your everyday work environment. You may assume that the number of people approximates how many coworkers would be in the general vicinity.

Job Performance


1. In terms of percentage, to what extent were the employee's objectives reached during the last year?
2. How do you evaluate the employee's overall performance in the last year?
3. How do you evaluate the quality of the work he/she has done in the last year?
4. How do you evaluate the quantity or volume of the work he/she has done in the last year?

Original directions: none included

Original response scale: Question 1: 10-point scale, 1 (10%) to 10 (100%). Questions 2-4: 10-point scale ranging from 1 (extremely negative) to 10 (extremely positive).

Adapted measure:

1. Please indicate the quality of work you think that you would produce in this environment
2. Please indicate the quantity of work you think that you would produce in this environment

**Adapted directions:** Please indicate how you would anticipate responding to these questions assuming that this was your everyday work environment. You may assume that the number of people approximates how many coworkers would be in the general vicinity.

**Adapted response:** 10-point scale ranging from 1 (extremely low) to 10 (extremely high).
Figure 1. Hypothesis 1: Interaction between extraversion and extraverted environment for PE-fit.

Notes. EX_EN: Extraverted Environment, FIT: PE FIT, MBTI_MEA = 6: low MBTI score, MBTI_MEA = 34: high MBTI score.
Appendix B

Vignette 1

Vignette 2
Vignette 3

Vignette 4
Vignette 11

Vignette 12
Vignette 19

Vignette 20
Vignette 21

Vignette 22
Appendix C

Vignette 1

Vignette 2
Vignette 3

Vignette 4
Vignette 7

Vignette 8
Vignette 11

Vignette 12
Vignette 15

Vignette 16