THESIS

THE PHYSIOLOGICAL MEASUREMENT OF EMPLOYEE ENGAGEMENT

Submitted by

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ABSTRACT

THE PHYSIOLOGICAL MEASUREMENT OF EMPLOYEE ENGAGEMENT

Previous assessments of employee engagement have all been self-report, creating the possibility for common method bias and a gap in assessing all components of the construct, especially the physiological component. The purpose of this study was to measure engagement using a physiological approach that reflects actual physical differences in individuals experiencing an engaged versus an unengaged state. In a within-subjects laboratory study, 40 college-aged participants were assessed using the BIOPAC physiological measuring system in both an engaged and an unengaged task condition. GSR findings indicate that a heightened level of arousal was present in the engaged versus unengaged task, but that the arousal level was not strong enough to produce an increase in heart rate. Implications of results are that we may want to re-evaluate how employee engagement is defined and how it is measured.

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THE PHYSIOLOGICAL MEASUREMENT OF EMPLOYEE ENGAGEMENT

Employee engagement appears to be a perplexing construct to both researchers and practitioners, with little agreement over a single definition (e.g., Kahn, 1990; Macey & Schneider, 2008; Maslach & Leiter, 1997; May, Gilson, & Harter, 2004; Schaufeli, Salanova, Gonzalez-Roma, & Bakker, 2002). Most do concur, however, that engagement is about employees giving their all to their jobs. For the purposes of this study, engagement is defined as the cognitive, physical, and emotional application of an individual's self to his or her work (Kahn, 1990). Kahn's definition reflects a strong theoretical rationale for engagement, and recent empirical work supports the model (e.g., May et al., 2004; Rich, LePine, & Crawford, 2010) strengthening its validity.

Regardless of the specific definition adopted, research has identified a number of positive outcomes of engagement, such as job satisfaction (Koyuncu, Burke, & Fiksenbaum, 2006), self-efficacy beliefs (Llorens, Schaufeli, Bakker, & Salanova, 2007), business performance (Lockwood, 2008), organizational commitment (Saks, 2006), and organizational citizenship behaviors (OCB; Saks, 2006). In addition to the positive individual attitudinal and behavioral outcome variables associated with employee engagement, organizations also benefit from understanding how engagement can increase their profitability. Namely, employee engagement not only results in high performance levels, but appears to have critical financial ties associated with its presence or absence. In one astounding figure, the Gallup Organization (2002) estimated that the annual cost of unengaged employees in the United Sates is between $292 and $355 billion and that

decreasing the percentage of disengaged employees 5% every year would boost U.S. annual productivity by $79 billion.

Considering these potential benefits, it is no surprise that researchers have been scrambling to assess employee engagement. Though some measures exist, there has been little variety of assessment methods used, with almost all engagement measures in the form of a self-report survey that is administered some time after the actual state of engagement occurs (e.g., Bakker & Demerouti, 2008; Duran, Extremera, & Rey, 2004; Hallberg & Schaufeli, 2006a; Koyuncu, Burke, & Fiskenbaum, 2006; Richardsen, Burke, & Martinussen, 2006). The reliance on one type of methodology for assessing both predictor and outcome constructs has been shown to be a source of systematic error in behavioral research (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Furthermore, the use of a single survey administration assumes employee engagement is stable over time and thus can be captured in one assessment event, rather than a state that varies over time, which requires multiple capture events. According to Kahn (1990), however, engagement varies from moment-to-moment, rendering a self-report measure insufficient to fully capture the construct. The reliance on self-report in previous research, therefore, presents an opportunity for the present study to contribute significantly to the literature by using a physiological measure to assess employee engagement. The goal of using this type of measure is to determine whether engagement really is a state of physical arousal, which will provide further insight into employee engagement as it is occurring. Therefore, the core purpose of this study was to answer the following basic research question: can physiological measures be used to assess employee engagement?

Defining Engagement

An examination of the two most prominent definitions and their differences, as outlined below, is essential for understanding how to measure employee engagement. The first definition, engagement as the opposite of burnout, is grounded in the stress literature and has been pursued empirically. The second definition, engagement as the application of the core self to the work role, is the definition used in this study and has strong theoretical support. Although other definitions have been proposed, these two have generated the most research interest and have been the focus of measurement of employee engagement in the academic literature. Further, though each definition has its own merits, Kahn's (1990) model of engagement will serve as the operational definition in this study. As will be discussed in the following section, Kahn's model was chosen based on its theoretical grounding and use of cognitive, physical, and emotional aspects to explain employee role performance, otherwise known as employee engagement.

Engagement as the Opposite of Burnout

One definition of employee engagement that has been proposed is that engagement is the opposite of burnout.

Development history. Inspired by the trend towards positive psychology, Maslach and Leiter (1997) redefined burnout as an erosion or decrease in engagement. Their definition of burnout is defined as the "prolonged response to chronic emotional and interpersonal stressors on the job, and is comprised of three dimensions: exhaustion, cynicism, and inefficacy" (Maslach & Leiter, 1997, p. 397; Maslach, Schaufeli, & Leiter, 2001). Their first dimension of burnout, exhaustion, is one of the most widely reported aspects of burnout (Maslach et al., 2001). Exhaustion refers to physically and psychologically fatigued employees who, as a result of their overtiredness, distance

themselves emotionally and cognitively from their jobs. The second dimension, cynicism, is hallmarked by an indifferent or pessimistic attitude towards work. Usually, cynicism is noted as a direct response to exhaustion, and empirical evidence supports this supposition (Maslach et al., 2001). The last dimension of burnout, inefficacy, is defined by reduced personal accomplishment. The authors proposed that a poor fit between employees and their jobs would lead to burnout (Maslach & Leiter, 1997). Conversely, they concluded that the better the fit between the person and his or her job, the more likely the employee would be involved in his or her work. In this light, the concept of engagement as the polar opposite of burnout was born (Maslach & Leiter, 1997).

Maslach et al. (2001) subsequently revised the original definition of employee engagement, referring to it as "a persistent, positive affective-motivational state of fulfillment in employees" (p. 417). Like burnout, this new definition of employee engagement is also characterized by three dimensions: vigor, dedication, and absorption. Vigor is considered to be the opposite of exhaustion and is characterized by a willingness to contribute energy into a task, an ability to avoid fatigue, and demonstrating persistence in completing a task (Gonzalez-Roma, Schaufeli, Bakker, & Lloret, 2006). Dedication is the opposite of cynicism and refers to when employees feel enthusiastic about their work and become involved in their task (Gonzalez-Roma et al., 2006). The third dimension, absorption, is characterized by total immersion into the work, to the point where the employee is so involved in what he or she is doing that he or she does not notice the passage of time. In a factor analysis, the first two dimensions, vigor and dedication, factor well as the opposite of their burnout counterparts (exhaustion and cynicism, respectively; Schaufeli & Salanova, 2007). The third dimension, absorption, however, does not factor

well as the opposite of inefficacy. After carefully considering the factor analysis results, Schaufeli and colleagues (Schaufeli, Salanova, González-Romá, & Bakker, 2002) decided to move away from defining and measuring engagement as the positive antipode to burnout, though substantial overlap with the burnout definition remains, as do the original three dimensions of engagement, vigor, dedication, and absorption. To assess employee engagement per their definition, Schaufeli et al. (2002) developed the Utrecht Worker Engagement Scale (UWES), a self-report measure.

In an effort to explain when employees become engaged, Bakker, Schaufeli, and their colleagues (e.g., Bakker, Demerouti, De Boer, & Schaufeli, 2003; Demerouti, Bakker, Nachreiner, & Schaufeli, 2001) applied the Job-Demands Resource Theory (J-DR; Bakker, et al., 2003; Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). According to this theory, job demands and job resources act as inhibiting and contributing factors, respectively, to engagement and burnout. Job demands refer to psychological and physical costs associated with the job. For example, in a study of Finnish teachers, Hakanen, Bakker, and Schaufeli (2006) included disruptive student behaviors, work overload, and a poor physical work environment as typical job demands. As costs, job demands increase the likelihood of burnout and decrease the likelihood of employee engagement. Conversely, job resources enhance the likelihood of employee engagement and decrease the risk of burnout by reducing job demands, assisting in work goal achievement, and stimulating personal growth (Bakker et al., 2003). Hakanen et al. (2006) found that job control, access to information, supervisory support, innovative school climate, and social climate served as job resources for teachers. Essentially, Schaufeli, Bakker, and colleagues believe that employees with higher job resources than

demands become engaged, whereas those with higher job demands than resources become burned out. Schaufeli and colleagues (e.g., Hallberg, Johansson, & Schaufeli, 2007; Llorens, Bakker, Schaufeli, & Salanvoa, 2006; Montgomery, Peeters, Schaufeli, & Den Ouden, 2003; Prieto, Soria, Martinez, & Schaufeli, 2008; Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007) utilize the J-DR model for explaining employee engagement because of its applicability to several different types of work environments, arguing that while specific jobs differ, every job has two basic characteristics: job demands and job resources.

Empirical support. A number of researchers have pursued Maslach et al.'s (2001) three dimension conceptualization of engagement. For example, Gorter, te Brake, Hoogstraten, and Eijkman (2008) used Schaufeli et al.'s (2002) three part definition of engagement when assessing the applicability of the J-DR model to dentists, obtaining results consistent with previous uses of the J-DR in engagement and burnout. Similarly, Mauno, Kinnunen, and Rouklainen (2007) used the same three part definition in their study of Finnish healthcare workers, also finding support that was consistent with the use of the J-DR model.

Empirical support for Schaufeli et al.'s (2002) three-prong construct of employee engagement has not been as extensive as the research actually using the UWES, which claims to assess the three dimensions as distinct components or factors. That is, researchers use the measure without confirming its factor structure, even though few beyond Schaufeli et al. have demonstrated a three factor structure. Recently, Xanthopoulou et al. (in press) provided confirmatory factor analysis evidence in support of Schaufeli et al.'s (2002) original scale construction. However, little additional work

appears available to confirm the factor structure and independence of the three components. Further research is warranted to provide additional construct validity evidence for Schaufeli et al.'s conceptualization of employee engagement, if it is to become a stronghold in the literature.

Strengths and weaknesses. The conceptualization of employee engagement as the opposite of burnout has some strengths, namely that one can assess the construct via self-report measures and that one can turn to the extant stress literature to develop testable models and hypotheses as to what employee engagement may be related. Incidentally, many of the existing studies using the UWES have indeed approached the study of engagement from a stress-strain perspective, providing supportive evidence for the use of Schaufeli et al.'s (2002) conceptualization of employee engagement in predicting outcomes related to stress. However, framing engagement as the opposite of burnout has its weaknesses. In particular, the definition of employee engagement appears somewhat limited in scope to that originally structured for burnout. That is, since the three components of employee engagement were originally constructed as opposites of the three burnout dimensions, they are inherently connected to stress (in this case the absence of negative stress), which contributes to confusion over construct uniqueness.

Engagement as the Harnessing of Self into the Work Role

Kahn's (1990) research on employee engagement was the first coherent attempt at identifying the construct. Based on qualitative data, Kahn found that there was variability in how much individuals were able to engage in their jobs from moment-to-moment.

Development history. Kahn (1990) developed his theory of engagement by drawing from two diverse sources of qualitative data: summer camp counselors and

members of an architecture firm. He chose qualitative methods of data collection because he felt that an in-depth look at particular moments and situations at work was the only way to truly understand how engaged an individual was at work. Based on Goffman's (1961) premise that people's attachment and detachment to their roles vary, Kahn sought to pinpoint the specific moments in which either application or withdrawal of the self occurred, naming these engagement and disengagement, respectively. More specifically, he defined engagement as "the harnessing of organization members' selves to their work roles" and disengagement as "the uncoupling of selves from work roles" (p. 694). Kahn further rationalized that workers express varying levels of engagement through their cognitive, physical, and emotional role performances. This consideration of cognitive, physical, and emotional aspects and his notion of immersing the self into one's work role are distinctive components of Kahn's theory.

Kahn (1990) concluded that one of the central tenants of engagement was whether or not individuals employed their *preferred self* in their role performances. The preferred self refers to the idea that individuals have many aspects to their personality and that there are certain aspects that people prefer to express. In the case of work-role performance, people take into consideration situational constraints that either encourage or inhibit the expression of their preferred self. Kahn's basic premise was that when people use their preferred self in their role performances, that connection fosters physical, cognitive, and emotional engagement. Conversely, disengagement was conceptualized as a defensive maneuver in which individuals feel the need to protect their preferred self. In this case, the uncoupling of the self from the role may result in a lack of physical, cognitive, and emotional engagement.

To explain the situational constraints that can either promote or inhibit engagement, Kahn (1990) turned to the work of Hackman and Oldham's (1980) job characteristics theory, wherein psychological states at work influence employee attitudes and behavior. Based on these psychological experiences, Kahn outlined what he referred to as psychological conditions, where work experiences shape the decision to use the preferred self, otherwise known as employee engagement. These psychological conditions include meaningfulness, psychological safety, and psychological availability. Meaningfulness is described as feelings of being "worthwhile, useful, and valuable" (p. 704). Kahn found three factors that influenced the perception of meaningfulness: task characteristics, role characteristics, and work interactions. The second psychological condition, psychological safety, refers to how secure individuals feel expressing their preferred self. If individuals sense that there will be negative consequences for expressing their true self, such as damage to self-image, reputation, or career, they are less likely to feel psychologically safe, and therefore less likely to personally engage. As with meaningfulness, Kahn hypothesized several influencing factors of psychological safety, including interpersonal relationships, group and intergroup dynamics, management style, and organizational norms. Lastly, psychological availability is described as having the physical, emotional, and psychological resources to engage. Anything that reduces these resources is considered to be a distraction and inhibits one's ability to engage. Furthermore, Kahn's data suggested that there were four influencing factors on availability: physical depletion, depletion of emotional energy, individual insecurity, and life outside work.

Empirical support. Despite the acceptance and use of Kahn's (1990) employee engagement definition within the literature (e.g., Avery, McKay, & Wilson, 2007; Cartwright & Holmes, 2006; Freedman, 2008; Luthans & Peterson, 2002; May et al., 2004; Reynolds, 2008; Rich et al., 2010; Rothbard, 2001), there is a relative dearth of empirical research using Kahn's model. This is most likely because there has not been an established measure of engagement using Kahn's definition, unlike Schaufeli et al.'s (2002) work that produced the UWES. May et al. (2004) confirmed the importance of Kahn's three psychological conditions in predicting engagement in their efforts to create a measure. Unfortunately, they were unsuccessful at creating a three component scale with strong reliability and validity evidence. Rich and colleagues (Rich, LePine, & Crawford, 2010) recently created a promising measurement scale based on the model proposed by Kahn. In developing the scale, Rich et al. incorporated the three ways in which employees express their engagement: cognitively, emotionally, and physically. Furthermore, Rich et al. added to the construct validity of engagement as a distinct construct from job satisfaction and job involvement. Their study provides validity evidence in support of the measure, which like the UWES, is self-report.

Strengths and weaknesses. Kahn (1990) offers a complex, yet thorough definition and explanation of how employee engagement occurs. Strengths of his definition include that it is grounded in established theory, namely Goffman's (1961) role theory and Hackman and Oldham's (1980) job characteristic theory. His construct definition is supported by qualitative data, providing initial external validity evidence for his three components. Weaknesses of Kahn's model include the lack of an established measure for assessment, though Rich and colleagues (2010) have recently created a promising self-

report scale. Like the UWES, however, this scale also suffers from concerns of self-report assessment.

Summary of the Engagement Literature

Despite the popularity of the term employee engagement, the research community has yet to agree on either the distinctiveness or definition of the construct (Macey & Schneider, 2008). Nevertheless, several researchers have presented their own definition of engagement, ranging from the positive antithesis of burnout, to a conglomerate of several attitude and behavioral constructs (Macey & Schneider, 2008), to the expression of an employee's preferred self (Kahn, 1990).

Kahn's model was chosen for this study based on its theoretical grounding and use of cognitive, physical, and emotional aspects to explain employee role performance. In comparison, other definitions of employee engagement (e.g., Harter et al., 2002; Maslach et al., 2001) lack important conceptual components, such as strong theoretical support, and the emotional, cognitive, and physical aspects of employee engagement. Because other definitions allude to these three aspects of employee engagement, it was determined that Kahn's definition would be the most valuable to adopt.

Studying Employee Engagement within Organizations

Research has suggested that employee engagement is related to a number of favorable outcomes on two levels: employees and organizations (Koyuncu, Burke, & Fiksenbaum, 2006; Llorens, Schaufeli, Bakker, & Salanova, 2007; Lockwood, 2008; Saks, 2006). Employees benefit from high engagement through job satisfaction and self-efficacy. Job satisfaction is important to employee well-being and has been shown to be negatively related to frustration, anxiety, and tension (Jackson & Schuler, 1985; Jex &

Spector, 1996; Spector & Jex, 1998). For example, in their study of possible antecedents and consequences of engagement, Koyuncu, Burke, and Fiksenbaum (2006) found a moderate but consistent and positive relationship between engagement and job satisfaction. Other research has shown support for these findings (e.g., DDI, 2004; Gill, 2007; Saks, 2006).

Self-efficacy has also received strong empirical support as a beneficial outcome of employee engagement and is important to employees because it is positively related to the adjustment of newcomers to an organization (Saks, 1995), coping with career related events (Stumpf, Brief, & Hartman, 1987), and skill acquisition (Mitchell, Hopper, Daniels, George-Falvy, & James, 1994). In addition, engagement increases self-efficacy, leading to higher goal setting, which in turn results in goals being pursued with effort and persistence (Richardsen, Burke, & Martinussen, 2006). Llorens, Schaufeli, Bakker, and Salanova (2007) demonstrated that through engagement, self-efficacy beliefs were improved and led to an increase in resource attainment for the individual.

Organizations benefit from high employee engagement through employee proactive behavior, organizational commitment, low turnover, high performance, and positive financial indicators (e.g., Crant, 2000; Harter, Schmidt, & Hayes, 2002; Koyuncu, Burke, & Fiskenbaum, 2006; Rischardsen, Burke, & Martinussen, 2006; Schaufeli & Bakker, 2004). For example, in one study, researchers found that engagement mediated the effect between organizational justice and extra-role customer service, where the role of engagement fostered employee organizational citizenship behaviors directed at the customer (Moliner, Martinez-Tur, Ramos, Perio, & Cropanzano, 2008). Furthermore, organizations can also benefit from engagement in the form of

employees' organizational commitment. Organizational commitment has been defined as "a desire, a need, and/or an obligation to maintain membership in the organization" (Meyer & Allen, 1991, p. 62). Commitment is important to organizations because it is negatively correlated with absenteeism and turnover, and positively correlated with performance (e.g., Meyer & Allen, 1991). Recent research has shown a positive relationship between engagement and organizational commitment (Richardsen, Burke, & Martinussen, 2006).

In addition, several studies have established the relationship between employee engagement and low turnover intentions (e.g., Koyuncu, Burke, & Fiksenbaum, 2006; Schaufeli & Bakker, 2004; Schwartz, 2007). Employees who demonstrate engagement are more likely to stay with the organization, which benefits the organization through decreased disruption to work load and low costs for turnover (Roberts & Davenport, 2002). Further, Roberts and Davenport found a significant relationship between employee engagement, turnover intentions, and actual turnover. They demonstrated that engagement significantly reduced turnover, and that reduced turnover led directly to decreased costs for the organization, since unplanned turnover can increase costs through the exiting of old employees and the recruitment and training of new employees. The consulting firm Development Dimensions International (DDI, 2004) found that when employee engagement scores were high, employees were less likely to leave the organization.

Lastly, performance as an outcome of engagement has also received substantial empirical support. Engaged workers are more productive, more creative, and more willing to expend discretionary effort than unengaged workers (Bakker & Demerouti,

2008). Data from one meta-analysis (Harter, Schmidt, & Hayes, 2002), based on almost 8,000 business units and 36 companies, provided support for the relationship between engagement and performance indicators, such as customer satisfaction, productivity, profit, and accidents. The authors found the strongest effects for employee turnover, customer satisfaction-loyalty, and safety (respectively). Moreover, Harter et al. (2002) showed engagement linking to both productivity and profitability, despite the fact that productivity and profitability are often overwhelmingly influenced by other factors such as competition, consumer spending, and trade legislation. These strong extraneous factors can make it difficult to find a relationship between profitability or productivity and a psychological construct, such as employee engagement.

Summary

There is no consistent definition of employee engagement, but enough overlap exists between definitions that general conclusions about the value of employee engagement have been made. An additional gap in the literature is the lack of empirical support relating to the physical engagement dimension identified in Kahn's definition (similar to vigor in Schaufeli et al.'s, 2002, definition) of employee engagement, which this study seeks to address. By capturing the physical component of definitions of employee engagement, I am adding to the construct domain as a whole, clarifying the existence of the physiological component. The belief that employee engagement has positive implications for both employees and organizations is prevalent among academics and practitioners, and research suggests that engaged employees are a valuable asset to organizations. In addition, the agreement among researchers on the number and strength of favorable outcomes associated with employee engagement reflects the necessity to

understand employee engagement, providing support for engagement research in industrial and organizational psychology.

Measuring Employee Engagement

Prior measurement of employee engagement in both the academic and popular press has followed the same general prescription (see Kahn, 1990 and Vinje, 2006 for exceptions): hand out a survey and ask participants to retroactively recall and describe their general level of engagement at work (e.g., Avery, McKay, & Wilson, 2007; Duran, Extremera, & Rey, 2004; Mostert & Rothman, 2006; Rothman, & Joubert, 2007). For example, the UWES, a nine-item scale, asks participants to rate statements about themselves on a 7-point Likert scale, ranging from (0) *never* to (6) *always*. The intention of the scale is to measure the three dimensions of employee engagement as defined by Schaufeli et al. (200): vigor, absorption, and dedication. The UWES has been used by several researchers (e.g., Duranet al., 2004; Gan, Yang, Zhou, & Zhang, 2007; Gill, 2007; Koppula, 2008; Richardsen et al., 2006; Sonnentag, 2003), who have obtained acceptable reliability of scores.

Another survey, the Gallup Organization's Gallup Workplace Audit (GWA), does not appear to be based on a theoretical framework (rather, it is an empirically devised scale). Because it is a proprietary instrument, little published information is available. However, according to Buckingham and Coffman (1999), authors of a book that describes the development and subsequent use of the GWA, it was originally designed to identify what makes for a good leader. It has recently been used for assessing employee engagement and is popular in industry. The GWA is popular because of its concurrent criterion-related validity for important organizational outcomes such as turnover,

productivity, and profit (e.g., Harter et al., 2002). Like the UWES, the GWA is a self-report survey.

Other researchers have created and used their own measures of employee engagement (e.g., Macgowan, 2000; Rothbard, 2001), since the UWES was not published until 2002. For example, the engagement scale created by Macgowan (2000) showed acceptable levels of reliability of scores, but was conceptualized as a group level occurrence, or the members' engagement in their group as demonstrated by attendance, contribution, interpersonal relationships, and adoption of the group contract. Therefore, the scale was not based on existing definitions of engagement and was correlated with group-oriented constructs, such as relating with members and working with others' problems. Rothbard (2001) defined engagement as the attention devoted to and absorption in work and family. As such, she created 18 self-report items: four work attention items, four family attention items, five work absorption items, and five family absorption items for assessing employee engagement. Though interesting, these studies provide little corroborating support for a single construct of employee engagement. To date, all existing assessments of employee engagement, including these tangential assessments, have all been self-report. This is an additional problem for the employee engagement literature, as the construct is defined as a state of action, but measured as a perception.

The advantages of the survey methodology include that surveys are fairly easy to administer, several people can be assessed simultaneously, and survey data as quantitative data can require less time to analyze than other data collection methodologies (e.g., qualitative data from interviews). There are also, however, several shortcomings

with the survey approach. The major disadvantage of exclusively using survey methodology in behavioral research is that results are subject to common method variance (also called common method bias), which occurs when "the measurement technique introduces systematic variance into the measure" (Doty & Glick, 1998, p.374). This systematic measurement variance ultimately leads to a disparity between actual and observed relationships between constructs (Doty & Glick, 1998). Common method bias, therefore, creates the possibility for researchers to draw incorrect or inappropriate conclusions based on their results.

According to research, attitude measures can be especially vulnerable to common method variance (Cote & Buckley, 1987). This finding is particularly troubling, as employee engagement is referred to and measured as a work attitude. Most behavioral research studies fail to account for common method variance, or if they do, they only account for random error rather than both random and systematic error (Podsakoff et al., 2003). Method variance can cause both Type I and Type II errors in empirical research by inflating or deflating the observed relationships.

Fortunately, in an effort to reduce systematic measurement error, researchers have been able to identify several sources of common method variance. Such sources of common method variance can include halo effects, social desirability, acquiescence, common rater effects, item characteristic effects, item context effects, and measurement context effects (Bagozzi & Yi, 1991; Podsakoff et al., 2003). One potential source of common method bias using self-report questionnaires concerns the use of a common rater to report both the predictor and criterion variables. In these cases, an artificial relationship between the predictor and criterion may be found due to consistency effects,

implicit theories, illusory correlations, social desirability, leniency biases, and acquiescence (Podsakoff et al., 2003). In the case of employee engagement, for example, one could see how social desirability may be especially problematic.

Another potential source of common method bias is the timing in which the assessment occurs. Namely, assuming that engagement is a long term and stable trait rather than occurring on a moment-to-moment basis causes researchers and practitioners alike to measure engagement some time after it occurs. This time lag represents a potential for method biases to influence respondent behavior in the retrieval stage of generating a response (Podsakoff et al., 2003).

The reliance on self-report surveys has potentially constrained our knowledge acquisition about what really is engagement. Specifically, employee engagement scales capture employees' perceptions of self at work, which fail to adequately assess actual emotional or physical engagement. Considering the broad definition of employee engagement by Kahn (1990), which includes physical, cognitive, and emotional components, it is most likely that self-report methodologies are not capturing the full scope of employee engagement. Therefore, a goal of this study is to diversify the present methodology used in engagement research in an attempt to capture a wider scope of the construct and to rectify the disparity between defining engagement as a state of action but measuring it as a perception.

To advance the employee engagement literature, a new approach in its measurement that complements the existing approach is proposed in this study. According to Podsakoff et al. (2003), there are two ways that common method variance can be controlled: (1) through the design of the study, and (2) through statistical controls

during data analysis. The goal of the current study is to increase our understanding of employee engagement by controlling for common method variance through study design and to assess more of the domain than current self-report survey methodology has been able to capture. One way of controlling for common method variance in the current study was to use two different types of measures, physiological measures and self-report survey measures. Further, two types of physiological measures were used: heart rate and galvanic skin response (GSR). Using physiological measures has the potential to provide a unique perspective on employee engagement (while it is occurring) that self-report alone is not able to provide.

Physiological Measures of Employee Engagement

Research shows that psychological constructs can be measured through physiological means, measuring psychological constructs such as the physiological effect of attraction on allocation of job resources (Senior, Thomson, Badger, & Butler, 2007), goal setting and mental effort regulation (Venables & Fairclough, 2009), and social ranking and choice behavior (Bault, Coricelli, & Rustichini, 2008). However, there is no precedent for physiological measures in the engagement literature. Therefore, this research adds to the literature by attempting to discern if physiological differences would occur between varying levels of engagement, such that those who were engaged showed higher levels of physiological arousal than those who were not. I propose that such physiological differences should exist, as Kahn (1990) and Rich et al. (2010) have stated and other researchers have implied (e.g., Schaufeli et al., 2002).

In general, physiological measures have the potential to capture a component of employee engagement that, as of yet, has not been assessed. Kahn's (1990) definition of

how employees apply varying degrees of themselves in their work is partially represented by the physical presence of employees. Kahn provides the following examples of physical engagement: one of the architects in the firm was “flying around the office” (p. 701) getting things done, while a scuba instructor was “darting about checking gear and leading the dive” (p. 700). The engaged employees appear to have a higher level of physiological arousal than the unengaged employees, who refrained from physically engaging in their jobs (one architect delegated tasks, whereas an instructor for windsurfing sent her students out while she relaxed on shore). Given Kahn’s example, it is logical to infer that physiological measures such as heart rate and GSR should assess this physiological arousal of employee engagement in a way that self-report measures cannot. Therefore, I hypothesize that heart rate during the engaged state will be significantly higher than heart rate during the unengaged state. In addition, I hypothesize that GSR during the engaged state will be significantly higher than GSR during the unengaged state.

BIOPAC Laboratory System

The BIOPAC laboratory system is an integrated set of software and hardware that is designed to measure a variety of physiological outcomes, with functions such as electromyography, electroencephalography, reaction time, pulmonary function, blood pressure, heart rate, and galvanic skin response among others (BIOPAC, 2003). According to Kahn (1990), engaged employees show higher levels of physiological arousal, an experience that cannot be captured easily by single-instance self-report data. Therefore, the BIOPAC system was used to measure galvanic skin response (GSR) and

heart rate, both indicators of physiological arousal, as a means of measuring employee engagement.

Galvanic skin response (GSR). The GSR is a bioelectric phenomenon that reflects minor electrical change in the skin and subcutaneous tissue (Vetrugno, Liguori, Cortelli, & Montagna, 2003). Though these minor changes can be seen throughout all areas of human skin, the palms of the hands, fingers, and soles of the feet are most sensitive to these changes. The GSR represents an adequate measure of physiological arousal because it reflects a sympathetic response to both physical and emotional stimuli. For example, a painful stimulus (such as a pin prick) elicits a general increase in sweat production. This increased sweat lowers the electrical resistance on the surface of the skin, which can be recorded by the GSR (BIOPAC, 2003). However, even if the stimulus is emotional (rather than physical), the GSR is still useful. For example, when individuals feel embarrassed, there is a vasodilation of subcutaneous blood vessels, resulting in the common experience of blushing, a physiological change to an emotional stimulus that the BIOPAC can measure and record (BIOPAC, 2003).

In terms of measuring engagement, the GSR can be particularly helpful. Considering Kahn's (1990) examples of engagement, it logically follows that an increase in GSR is consistent with his definition. For example, the architect who was bustling around the office should show a greater increase in GSR than would someone passively sitting in his or her cubicle (note that we are talking about an *increase* in GSR, which takes into account individual differences/baseline differences). Here, critics would argue that just because individuals are sitting passively in their cubicle does not mean that they are unengaged. However, the GSR is able to account for physiological changes as a result

of emotional responses. For example, Kahn describes a disengaged camp counselor who is unemotional and disconnected to her work role, using little if any emotion. In this case, the low physiological engagement would mean there would be little change from baseline in the GSR as this employee performed his or her work role. Conversely, those who are continually applying their emotions to their work roles would see a change from their physiological baseline in their GSR, assuming their baseline is captured in an unengaged state. Therefore, I hypothesize that GSR during the engaged state will be significantly higher than GSR during the unengaged state.

Heart rate. In addition to measuring GSR, the BIOPAC system is capable of assessing participant heart rate (BIOPAC, 2003). Heart rate is calculated by measuring the wave of blood pulsed from the heart during each cardiac cycle to the extremities, such as the wrist or fingertips (BIOPAC, 2003). Changes in heart rate can be attributed to environmental factors such as temperature, body position, and emotions, among others.

Similar to the GSR, knowing changes in heart rate can help to assess employee engagement. First, changes in heart rate can explain physical engagement when employees are actively applying their physical selves to their work roles. Admittedly, not all work roles require an extensive amount of physical arousal, such as the senior architect in Kahn's (1990) example. However, in parallel form to the explanation of GSR, measures of heart rate can reflect more than just physical activity. Emotions can also affect the rate of blood flow in the body, usually by increasing cardiovascular activity and consequently heart rate (e.g. Brosschot & Thayer, 2003; George, Ketter, Parekh, Herscovitch, & Post, 1996; McCraty, Atkinson, Tiller, Rein, & Watkins, 1995). Consider an employee who is emotionally or cognitively engaged in his or her job. Such excitation

is likely to lead to a physiological response from the body, such as an increase in heart rate, assuming their baseline is captured when unengaged. Therefore, I hypothesize that heart rate during the engaged state will be significantly higher than heart rate during the unengaged state.

In summary, the use of the BIOPAC system to measure GSR and heart rate as indicators of employee engagement is justified, especially in regards to the physical and emotional aspects that employees use when harnessing themselves to their work roles, per Kahn's (1990) model of engagement.

The Current Study

The central function of this study was to address some of the methodological issues that have previously thwarted clarity in understanding employee engagement. The purpose of this study was to answer the following basic research question: can physiological measures be used to assess employee engagement and lead to more knowledge about the construct? The triangulation of methods used in this study not only follow Podsakoff et al.'s (2003) suggestion for variance control through experimental design, but also add construct validity evidence to the current available measures and help extend knowledge about employee engagement.

Method

The research question was tested by using a within-subjects experimental laboratory design, in which participants were exposed to and observed in an engaged and unengaged state. The engaged and unengaged task were similar in content, both asking participants to rate fictitious job candidates on the candidates' suitability for a potential job, in order to control for confounds introduced when using different tasks across

conditions.

The decision to use a laboratory design as opposed to a field experiment was based on the exploratory nature of the study, and the lack of previous research attempting to use physiological measures to study engagement during its occurrence. Furthermore, a field experiment increases the level of complexity of the control necessary for measuring moment-to-moment physiology, and assumes that one knows already that engagement can be assessed using psychological measures. In addition, randomly assigning engaging and unengaging tasks to employees would be especially difficult, given that most organizations would not approve of purposefully assigning an unengaging task, not to mention the challenge of hooking up their employees to physiological equipment while doing so.

Participants

A total of 47 participants were recruited from undergraduate psychology courses at Colorado State University in exchange for course credit (see Appendix A for recruitment summary posted on the research pool website), with 40 participants actually participating (a response rate of 85.1%).

When using physiological data, there are some individual differences in skin tissue composition that can prevent BIOPAC from reading an individual's measurements. In the current study, these occurrences were rare, unsystematic, and when they did occur, they posed no threat to the participant, though did necessitate that the participant's data be discarded. Participants still received credit even if their data had to be deleted. The data of eight participants had to be dropped due to failed BIOPAC measurement. Of the remaining 32 participants who completed both the demographic survey and had usable

physiological data, 63% were male (N = 20) and 37% were female (N = 12). The majority were White/Caucasian (84.3%), with 3.12% reporting to be Asian/Pacific Islanders, 3.12% African American, 6.25% Latin American/Hispanic, and 3.12% reporting other. The average age of all participants was 20.09 years (SD = 2.49) with a mean of 2.47 years work experience.

Procedure

Subjects voluntarily participated in both the engaging and unengaging conditions. However, the order of tasks was randomly assigned, such that half the participants received the engaging task first and the unengaging task second, and the other half of participants received the unengaging task first and the engaging task second. The random ordering of engaged and unengaged tasks was to help minimize any ordering effects resulting from the nature of the tasks. For example, it might be more difficult to switch from engaged to unengaged versus vice versa, unengaged to engaged. By randomizing the order, any possible relationship between the conditions was controlled.

Requiring only one session, participants began by meeting a trained researcher who welcomed and introduced participants to the study. The trained researcher then used deception to explain the study's two major goals: to correlate physiological responses and personality, and to pilot test the use of *Facebook* in hiring practices. Participants were informed that their physiological responses would help researchers learn about the physical components of personality and that their participation in ranking potential job candidates would be used to create future hiring practices. At this point, the researcher explained how the physiological equipment would be attached and used in this study (see Appendix B for consent form). All participants were asked to read and sign a consent

form, if they wished to participate.

Though not ideal from a regulatory compliance in human subjects research standpoint, deception was necessary to maintain the integrity of the study. Specifically, if participants were aware of the true nature of the study, they might have tried to alter their behavior in a way that they perceived as socially desirable. For instance, if a participant was assigned the unengaged task, but was aware the study was about engagement in general, he or she may have attempt to be engaged in the task solely based on his or her knowledge that the experiment was about engagement. Conversely, the participant may have over exaggerated being unengaged assuming he or she was supposed to be bored, which could have led to anger or frustration, or otherwise distorted the unengaged data. The participant may have also acted over excited in the engagement task. Either case of over or under reacting based on participants' preconceived notions of the study could have introduced confounds and negatively affected the study validity. All participants were appropriately debriefed at the end of the study.

After introductions were concluded, consent was obtained, and the physiological measures were put in place, all participants completed the demographic questionnaire (see Appendix C). In addition, they also filled out personality questionnaires (Appendix C). The use of the personality questionnaires served two functions. The first was to lend legitimacy to the cover story about the researcher's interest in personality. The second function was to allow enough time to pass (5-10 minutes; e.g. Kassam, Koslov, & Mendes, 2009; Parekh & Lee, 2005) so that a sufficient assessment of the subject's baseline physiological rates was obtained. After these baseline measures were obtained, the independent variable, engagement or disengagement, was introduced while the

BIOPAC was still recording.

Engaged task. In the engaged condition, participants rated actual profiles from the social networking site, *Facebook* (see Appendix D). Participants were asked to work individually. As the participants began the engaged *Facebook* task, they chose two out of four genuine profiles and rated the individuals in those profiles on how well they met the specified criteria of the job for which they were applying. There were some guidelines and criteria for each profile that the participant reviewed (see Appendix D).

The *Facebook* rating activity was chosen because it was easy to manipulate the situational constraints relevant to engagement (e.g., psychological meaning, safety, and availability) as previously described by Kahn (1990), and because it was anticipated that most students would find the task minimally pleasant given that it was internet-based, information rich, and provided immediate connection (Martin, 2005; Tapscott, 1998). This task taps into psychological meaning as defined by Kahn. Based on Hackman and Oldham (1980), Kahn felt that task characteristics should be challenging and clearly delineated, yet varied, creative, and somewhat autonomous. For this study, the participants had written guidelines for each profile and had to actively think about the criteria with which they chose to rate each profile. However, finding the relevant information was not so difficult as to detract from their ability to perform the rating. Lastly, the task was varied and creative, as each profile was unique and the participants had latitude with which to assess each profile. With each profile being genuine and unique, the answers were not necessarily straightforward, forcing participants to think creatively about their rating decisions.

The second factor that influences perception of meaningfulness, role

characteristics, involves (1) identity and (2) status or influence. Kahn (1990) found that when one or both of the identity and status dimensions were high, psychological meaningfulness and, therefore, employee engagement were high. Having participants create ratings for potential employees is likely to positively influence both their identity as a decision maker and status because they feel they have the power to make decisions. The last dimension of Kahn's psychological meaningfulness is work interactions. Work interactions refer to rewarding and interpersonal experiences with clients and co-workers that lead to psychological meaningfulness and employee engagement. Because the BIOPAC measurement system can only assess one participant at a time, there were practical limitations on how many people could be in the room during the experiment. Therefore, because a task was specifically chosen for this measurement instrument, it was not logistically possible to include the manipulations of social work interactions. Kahn, however, does not specify that all three conditions must be simultaneously present; therefore, it was anticipated that the lack of a social work interaction manipulation in the presence of the other two conditions would have little effect on the study outcome.

Psychological safety is the second situational constraint that Kahn (1990) suggested can either promote or inhibit employee engagement. Factors influencing an individual's perception of psychological safety include interpersonal relationships, group and intergroup dynamics, management style, and organizational norms. Though the individual nature of the current study necessarily limited the researcher's ability to manipulate most of these influences, actions were taken to make the engagement task feel as psychologically safe for participants as possible. Namely, the directions and paperwork associated with the task reflected some of the values associated with

psychological safety. Specifically, the directions included information to explain that the study was completely voluntary and confidential, and stressed that participants could participate without worrying about negative consequences, such as damage to their self-image, career, or status (Kahn, 1990).

The final situational constraint discussed by Kahn (1990) is psychological availability, or having the physical, emotional, or psychological resources to become engaged. Efforts to increase psychological availability immediately before the task, however, presented a unique set of problems. Prior research has shown that mindfulness exercises not only result in psychological well-being (referred to by Kahn as availability), but also decrease one's heart rate (Kutz, Borysenko, & Benson, 1985). Although the increase in psychological availability would have been desirable, the sudden decrease in heart rate may have confounded the true relationship between engagement and physiological measures. Thus, if students come to the current study with low psychological availability, it is possible that their inability to become psychologically available may have dampened their level of engagement. Again, Kahn does not specify that all three situational constraints (meaning, safety, and availability) must exist for employees to enter an engaged state. Therefore, it was anticipated that if meaning and safety could be maximized, a potential lack of psychological availability at the start of the experiment would not be detrimental.

Unengaged task. In the unengaged condition, participants also rated fictitious profiles from the social networking site, *Facebook* (see Appendix D). Like participants in the engaged task, participants were asked to work individually. As the participants began the unengaged *Facebook* task, they were assigned two genuine profiles (rather than given

a choice) and told to rate the individuals in those profiles on how well the individuals meet the specified criteria of the job for which they are applying (see Appendix D).

As with the engaged task, the situational constraints in the unengaged task were manipulated, to allow for maximum discrimination between the engaging and unengaging tasks. Specifically, to discourage psychological meaning, the task was purposefully designed to be more mundane and less cognitively difficult, though not boring, as well as designed to prevent a sense of identity or status from the activity. To minimize the impact of psychological safety, participants were given the study directions in a dry and matter-of-fact manner (dry in both tone and style) with no hint of empathy or supportiveness, and the sentence explaining that results would not negatively influence their status, career, or self-image was omitted. However, for protection of human subjects, participants were still informed that their participation would be confidential and that they could discontinue the experiment at any time.

For both conditions, when the *Facebook* task was completed, participants completed a series of questionnaires regarding their experiences. Rich et al.'s (2010) measure of engagement was used to assess self-reported engagement. After the first task and follow-up questions were completed, there was a short break (approximately 5 minutes) for participants. During this break, they spent time on www.cognitivefun.net, a website featuring cognitive games that activate attentional, perceptual, executive, and memory functions (e.g., the Stroop task, go/no-go visual task, etc.). The purpose of this break was to return participants' physiology to baseline and to prevent participants from remembering the survey questions. The specific use of the cognitive tasks further distracted participants from remembering each set of surveys, particularly important

because the surveys administered after the engaging and disengaging tasks were the same. Though the cognitive games were initially enjoyable for participants, they became bored very quickly, with their physiological measures returning to baseline within one or two minutes.

Upon conclusion of both the engaging and unengaging tasks, and filling out the subsequent surveys, researchers removed the BIOPAC equipment from the participant, all participants were debriefed about the true nature of the study (see Appendix E), and then dismissed. Research credit was assigned at the end of each session. A manipulation check was performed after each task to ensure that participants accurately perceived their tasks as either engaging or unengaging.

Measures

See Appendix C for a complete list of all survey items.

Engagement (*Physiological).* Physiological responses, specifically heart rate and galvanic skin response (GSR), were measured using the BIOPAC system. To measure participants' GSR, two disposable electrodes were attached to their index and middle finger on their non-dominant hand (to avoid problems with completing questionnaires). Heart rate was measured by attaching three electrodes: one on their non-dominant wrist and one on each ankle (just above the ankle bone on the inside of the leg). For each electrode placed on the body, there were corresponding leads (wires) that connected the electrodes to the BIOPAC system for recording. Data was directly entered into the computer software, after which the data was uploaded into Excel and SPSS for analysis.

Engagement (Self-Report). Self-report perceptions of engagement were assessed using Rich et al.'s (2010) measure of employee engagement ($\alpha = .94$ for this sample).

Responses were captured using a Likert-type response scale ranging from 1, *strongly agree*, to 5, *strongly disagree*. A sample item is "At work, my mind is focused on my job."

To confirm the appropriateness of the three-factor structure of the scale for this sample, I conducted confirmatory factor analyses (CFA) on Rich et al.'s (2010) scale using the statistical software program EQS. I first ran the theorized three-factor model. However, this was not a very good fit to the data (χ^2 = 248.42, df = 132, p < .01, NFI = .63, CFI = .77, RMSEA = .17), as the fit indices (i.e., NFI, CFI) were way below the suggested values of .90 and the RMSEA was much larger than the recommended .06 (Hu & Bentler, 1999). Additionally, upon reviewing the factors, it appeared that the cognitive and physical factors were strongly correlated (r = .90). Therefore, I ran a CFA on a two-factor model, with affective items as one factor and combining cognitive and physical items for the second factor. However, this model fit the data only slightly better than the theorized three factor model when considering the change in chi-square statistics, but not in terms of the fit indices (χ^2 = 253.52, df = 134, p < .01; NFI = .62, CFI = .77, RMSEA = .18). Results from a one-factor CFA were worse (χ^2 = 341.93, df = 135, p < .01; NFI = .48, CFI = .59, RMSEA = .23), suggesting that although the results are outside of adequate fit standards, Rich et al.'s scale should remain intact as a three-factor structure.

Personality. Though most research linking employee engagement and personality involves the Big Five factors of personality (McCrae & Costa, 1987), other variables such as perfectionism, positive affectivity, and self-efficacy have been shown to be related to employee engagement. The reliability scores reported below are those reported using the International Pool of Personality Items (IPIP). Responses were captured in the

format of a Likert-type scale, ranging from 1, *very inaccurate*, to 5, *very accurate*. *Conscientiousness* was assessed with ten items (α = .60). Sample items include "I want everything to be just right" and "I want things to go according to plan." *Perfectionism* was assessed with nine items (α = .83). Sample items include "I am always prepared" and "I pay attention to details." *Openness to Experience* was assessed with ten items (α = .79). Sample items include "I have a vivid imagination" and "I enjoy hearing new ideas." *Self-Efficacy* was assessed with ten items (α = .81). Sample items include "I know how to get things done" and "I excel in what I do."

Manipulation check. Two items were used to determine if the engagement manipulation worked. The first item was an either/or question: "My task was (circle one): engaging, unengaging." The second item was a dichotomous question, with a yes or no response ("My task was interesting").

Demographic variables. Participants were asked to provide demographic information, including age, gender, race, ethnicity, and work experience.

Data Analyses

Considering that this study is a first in assessing employee engagement with physiological measures, there is no standard as to which measurement points within physiological measures (e.g., mean, minimum, maximum) should be chosen for comparison. Since I wanted to maximize opportunities to learn about this construct, I chose to explore employee engagement through several types of measurement points including the minimum, mean, and maximum heart rate and GSR values.

Results

Means and standard deviations from the demographic survey results are shown in Table 1. All but the conscientious scale demonstrated adequate reliability (Nunnally & Bernstein, 1994), ranging from .79 to .83. Since the personality variables were not actually used in the final analyses, their reliability estimates were not an issue. In the next section, the results of the data analysis are organized as follows: 1) quantitative results regarding the manipulation check; 2) quantitative results regarding the physiological differences between engaged and unengaged individuals; and 3) quantitative results regarding the self-report differences between engaged and unengaged individuals.

Manipulation Check and Ordering Effects

Before results were analyzed, manipulation checks were performed to confirm engaged and unengaged conditions. Two items were used to determine if the engagement manipulation worked. The first manipulation check item, "My task was (circle one): engaging, unengaging" was assessed using a chi-square test. Results showed that participants did not rate the engaging task significantly more engaging than the non-engagement task ($\chi^2 = 1.64$, df = 1, $p = .20$). In addition, the second manipulation check item concerning task interest was also non-significant ($\chi^2 = .563$, df = 1, $p = .45$). The results from the manipulation check items suggest that the task manipulation did not work. Since the current study is a first to assess employee engagement using manipulated tasks and physiological measures, even though the manipulation checks failed, analyses continued in an effort to help understand and explain potential discrepancies in the physiological and self-report measures. To assess for possible ordering effects of the conditions, several two tailed *t*-tests with an alpha level of .05 were performed between tasks completed at time 1 and tasks completed at time 2 (see Table 2 for all *t*-test results).

The first series of *t*-tests were used to establish any significant physiological differences between time 1 and time 2, regardless of the task. Therefore, the average of all time 1 tasks was compared to the average of all time 2 tasks, a between subjects comparison. For all but one dependent variable, there were no significant differences between time 1 and time 2. That is, for mean GSR for engaged task, minimum heart rate for engaged task, minimum GSR for engaged task, mean GSR for unengaged task, minimum heart rate for unengaged task, and minimum GSR for unengaged task, there were no significant differences between time 1 and time 2. However, for the unengaged task, there was a significant difference ($t = -2.06$, $p = .05$) in calculated heart rate between time 1 ($M = 72.62$, $SD = 11.21$) and time 2 ($M = 82.30$, $SD = 14.02$), such that heart rate at time 2 was significantly higher than heart rate at time 1 for the unengaged task. Overall, however, these results suggest that there were no substantial ordering effects.

To asses for the possibility of differences in physiological reactions between baseline conditions, two two-tailed *t*-tests with an alpha level of .05 were performed. These *t*-tests were used to assess differences in the change in heart rate and the change in GSR between the two baseline conditions. Significant results would indicate that the baseline data collection periods (used to allow participants' physiological responses to normalize) had different effects within the same participant. Conversely, non-significant results would be a positive indicator that the participants responded similarly across both baseline collection periods. The first *t*-test to establish the equivalence of the two baseline collection periods used the average change in GSR reported from the BIOPAC system. Results from the *t*-test indicate that there were no significant differences in the changes in GSR across the first and second baseline collection periods ($t = 0.40$, $p = .70$). The

second *t*-test to establish the equivalence of the two baseline collection periods used the average change in heart rate reported from the BIOPAC system. Similar to the GSR data, results from the *t*-test indicate that there were no significant differences in the changes in heart rate across the first and second baseline collection periods ($t = 1.61$, $p = .12$). Based on the results of both *t*-tests, it can be concluded that changes within each baseline collection period did differ significantly between the two periods.

The Engaged State: Physiological Measures

Although the manipulation check failed, I proceeded with testing the research question because of the exploratory nature of the study, the lack of established evidence of actually being able to manipulate engagement in the lab, and the first time use of physiological measures for assessing employee engagement. The research question of whether there were significant differences within participants between the engaged and unengaged tasks was tested using a two-tailed paired sample *t*-tests (see Table 3). Two-tailed paired sample *t*-tests were used to assess for significant differences between the minimum, mean, and maximum values for both GSR and heart rate because 1) the samples were dependent; 2) the variables were normally distributed; and 3) the scale of the variables was nominal. The first set of *t*-tests was used to examine differences in the reported mean heart rate and GSR. The first *t*-test used the average heart rate reported from the BIOPAC system (per participant). Results from the *t*-test indicate that there were no significant differences in average heart rate between the engaged and unengaged states. However, results from the second *t*-test, which used the average GSR (in millivolts), indicated that there was a statistically significant difference ($t = 2.42$, $p = .02$) in mean GSR between the engaged ($M = 11.30$, $SD = 3.76$, $n = 32$) and unengaged tasks

(M = 10.18, SD = 3.78, n = 32). In other words, on average, there was more electrodermal skin activity occurring during the engaged task than during the unengaged task.

The second set of *t*-tests was used to examine differences in the reported maximum heart rate and GSR. Contrary to the hypothesized relationship, results show that there were no significant differences in either maximum heart rate or maximum GSR between the engaged and unengaged states.

A third set of *t*-tests were used to examine differences in the reported minimum heart rate and GSR. Results from the *t*-test examining minimum heart rate indicate that there were no significant differences in minimum heart rate between the engaged and unengaged states. However, results from the second *t*-test, which used the minimum GSR, show that there was a statistically significant difference ($t = 2.18$, $p = .04$) in minimum GSR between the engaged (M = 9.34, SD = 3.31, n = 32) and unengaged tasks (M = 8.22, SD = 3.63, n = 32). In other words, the electrodermal activity on the surface of the skin was stable at a higher level during the engaged tasks than the unengaged tasks.

Overall, the results of the quantitative analyses provide mixed support for the use of physiological measures to capture and differentiate between levels of engagement.

The Engaged State: Self-Report Measures

Self-report measures were used to establish whether participants perceived that they were engaged or not engaged, and for comparison with the findings from the physiological measures. It was expected that if their physiological assessment demonstrated that participants were engaged, that the self-report measures would reflect

the same. Likewise for the unengaged task; it was expected that when unengaged, physiological measures and self-report assessment would concur.

I first examined the differences between the self-reported levels of engagement on the engaged and unengaged tasks. A two-tailed paired samples *t*-test with an alpha level of .05 was conducted to compare differences in engagement. Though the mean of each scale was in the expected direction, such that the mean for the engaged task was slightly higher than the mean for the unengaged task, the results of the *t*-test indicated that the difference between the engaged state (n = 28, M = 3.67, SD = 0.74) and the unengaged state (n = 28, M = 3.57, SD = 0.64) was not statistically significant (t = 0.995, p = .33).

After establishing the non-significant differences using Rich et al.'s (2010) scale, I isolated the physiological sub-scale and examined the differences between the self-reported physiological levels of engagement for the engaged and unengaged tasks to see if they corroborated with the physiological assessment. A two-tailed paired samples *t*-test with an alpha-level of .05 was conducted. Though the mean of each scale was in the expected direction, such that the mean for the engaged task was higher than the mean for the unengaged task, the results of the *t*-test, again, indicated that the self-reported physiological differences between the engaged state (n = 28, M = 3.65, SD = .69) and the unengaged state (n = 28, M = 3.56, SD = 0.59) were not statistically significant (t = -0.988, p = .33).

Finally, as a last test, I correlated scores on the self-report measure with the physiological assessment (see Tables 4 and 5). I first correlated the self-report items for physical engagement with the physiological assessments and found no significant relationships (see Table 4). More specifically, the self-report items for physical

engagement were not significantly related to the minimum heart rate, mean heart rate, maximum heart rate, minimum GSR, mean GSR, or maximum GSR in neither the engaged nor unengaged conditions.

After finding no significant relationships between the physiological measures and Rich et al.'s (2010) physical sub-scale, I correlated the entire Rich et al. self-report engagement scale to the physiological measures of engagement (see Table 5). In particular, I correlated the full scale self-report items in the engaged and unengaged conditions to the physiological assessment of minimum heart rate, mean heart rate, maximum heart rate, minimum GSR, mean GSR, and maximum GSR of both the engaged and unengaged condition. Results were similar to looking at the physiological scale alone, as none of the relationships were significant.

Discussion

The purpose of this study was to measure employee engagement using a physiological approach that reflects actual arousal differences between and within individuals, a method of assessment that, as of yet, has never been done. A secondary purpose of the study was to help determine if assessing employee engagement on a physiological, moment-to-moment basis confirms current knowledge about employee engagement using self-report research. The results of the analyses provide limited support for the use of physiological measures to capture and differentiate between levels of engagement (as it is currently defined). However, the results suggest that the current conceptualization of employee engagement may be lacking important considerations.

Physiological Assessment

Galvanic skin response. When participants were in the engaged task, they were more engaged than when those same individuals were in the unengaged task. This conclusion is supported by two main findings. First, participants had a higher mean galvanic skin response in the engaged condition than in the unengaged condition. In other words, when participants were working in the engaged task condition, their bodies responded with an elevation in arousal level in the form of increased electrodermal activity. Conversely, when participants were working in the unengaged task condition, they had a smaller physiological reaction, suggesting that they were not as aroused as when they were in the engaged condition. The significant difference in GSR between the engaging and unengaging tasks for each participant, where GSR was significantly higher in the engaged task condition as compared to the unengaged task condition, indicates that people became more physiologically aroused when engaged. These physiological findings were significant, despite no significant differences in self-reported engagement, which is noteworthy.

The second finding regarding significant differences between the engaged and unengaged tasks was that when participants were in the engaged task condition, their GSR had higher minimum values than when they were in the unengaged task condition. In other words, when participants were in the engaged task, their physiological arousal was maintained at a higher level than when they were not engaged. The significant differences in minimum GSR is particularly interesting, as it hints at the possibility that even if engagement is not maximizing arousal levels, it at least maintains a stable level of physiological arousal, which may be beneficial for performance (Berlyne, 1960). As Berlyne argues, performance and arousal can be characterized by an inverted U-shaped

function. At both high and low levels of arousal, performance is minimal, whereas more moderate levels of arousal result in optimum performance. Therefore, the data from this study may be interpreted within the optimal level of arousal paradigm, such that the significant differences in the minimum arousal levels between the engaged and unengaged tasks is quite adaptive for performance.

Heart rate. The significant differences found in GSR did not hold true for any of the heart rate relationships. In other words, there were no significant differences in minimum, mean, or maximum heart rate between the engaging and unengaging conditions.

Summary of physiological assessment. First, even though a significant difference was reported between the engaged and unengaged tasks in regards to the mean and minimum GSR, there was no significant difference in any of the heart rate measures between the two conditions. This does not come as a complete surprise, however, as GSR has been shown to be especially sensitive to psychological constructs, capturing small changes in arousal associated with emotion and cognition (e.g. Critchley, 2002; Vecchiato, Astolfi, Fallani, Cincotti, Mattia, Salinari, Soranzo, & Babiloni, 2010). Another possible explanation for the lack of significant differences in heart rate is that since the participants used in this study were relatively young (mean age was 20 years old), they were most likely in good physical shape, in particular when compared with an older population (Van Heuvelen, Kempen, Ormel, & Rispins, 1998). Hence, it may be concluded that the sample here probably had a low resting heart rate that returned to baseline quickly after stimulation, especially if compared to an older adult (e.g., Tulppo, Makikallio, Seppanen, Laukkanen, & Huikuri, 1998). Though it is now clear that heart

rate is not a sensitive enough measure to capture changes in employee engagement, especially given a potentially fit sample, it was important to include because of the exploratory nature of this study and because it had the potential to maximize our knowledge about the physiological aspect of employee engagement. Without testing it, I could not have known that heart rate is a poor measure of employee engagement, at least in how it was manipulated in this study. Since physiological measures of employee engagement have never been previously used, no pre-existing studies or theories could have informed their use in this study. In this way, this study makes a significant contribution to the literature by having tested the use of both GSR and heart rate.

In addition, even though there were significant differences between the engaged and unengaged taskswith regards to the minimum and mean GSR, there was not a significant difference in the maximum GSR reported. One explanation for the lack of significant differences in maximum GSR is that there are moments within an unengaging task that can seize interest, even if the task as a whole is unengaging. Therefore, when individuals are engaged in a task, their physiological profile is fairly consistent, with higher means and minimums in GSR, along with occasional spikes in their maximum GSR. Conversely, when individuals are unengaged in the task, they demonstrate lower minimum and average levels, but can also randomly peak when they briefly find something of interest. This physiological profile fits with Berlyne's (1960) conceptualization of arousal and performance, described earlier. Considering the inverted U-shaped function of performance, it makes sense that engaged individuals do not become exceptionally aroused, as extended arousal that is extreme in nature may impede performance by exhausting an individual. Therefore, maximizing GSR may not be

adaptive for fostering employee engagement because such extreme arousal could lead to exhaustion over time. The results of this study, therefore, may provide some preliminary support for the hypothesis that employee engagement varies from moment-to-moment. Over time, the construct appears somewhat stable, which may explain why most measures have thus far assessed engagement as a stable construct. Additional studies that assess the moment-to-moment variability of employee engagement are still needed to draw a firm conclusion of this sort; however, this study provides the initial start to investigating physiological measures of employee engagement.

Self-report Assessment

There were no significant differences between the engaging and unengaging tasks on the self-report measure of engagement. There may be several reasons explaining why the self-reported engagement scores did not significantly differ between the two tasks. The first explanation is that the task manipulation was flawed. Although the *Facebook* task was initially appealing, it may not have been as easy to manipulate to suit the two conditions as originally thought. Another explanation for the failed manipulation is that the manipulation check items were perhaps poorly worded, such that participants misinterpreted the term *engagement*.

Second, by asking participants to think about and rate potential applicants, the strong cognitive component and sedentary nature of the task may have been a factor in reducing the variability in physical engagement between tasks. It is possible that even though individuals may have *perceived* that they were engaged, they were not actually aroused on a physiological level. Considering the findings from the factor analysis, this is a viable explanation. Specifically, the large correlation between the physical and

cognitive sub-scales of the Rich et al. (2010) scale of employee engagement and the poor fit of the confirmatory factor analysis to the data suggest that there may be some overlap with specific scale items for this sample. For example, the physical item, “I exerted a lot of energy on my task” did not correlate well with the other items in the physical subscale. Rather, it correlated with the cognitive sub-scale items much better (e.g., “I concentrated on my task” and “I was absorbed by my task”). In addition, some of the emotional sub-scale items (“I am proud of my task”; “I felt positive about my task”) showed the same pattern, correlating highly with the cognitive sub-scale items (e.g., “My mind was focused on my task” and “I was absorbed in my task”). It is plausible that because the task in this study was almost exclusively cognitive based (i.e., participants had cognitive load but no physical movement), participants answered the questions reflecting the domination of the cognitive requirements of the task, causing the factor structure to collapse somewhat. Had the task been more physically or emotionally demanding it is possible that participants would have responded differently to those questions, creating a different interpretation of and response to the items, generating a different correlation matrix within the factor analysis. Participants were so focused on the cognitive demands of the task that they perceived their levels of arousal to be cognitive in nature, which perhaps explains the high correlation between those two facets.

Contributions

Despite the mixed results, this study yielded findings worth further investigation. First, there were physiological differences in participants between the engaged and unengaged task conditions, such that during the engaged task, participants were more physiologically aroused than when they worked on the unengaged task. The implications

of these findings are that one may not actually have to *feel* physically aroused to actually *be* physically engaged; the perception of arousal may be what matters to one's self-perception of engagement. Additionally, the implications of these findings are that to register physical engagement with less sensitive measures than a GSR may require that one be in a physically demanding task.

Second, the strong correlation between the cognitive and physiological components of the self-report measure of engagement suggests that employees' perception of their level of engagement may be influenced by the nature of the task or job in which they work; that is, the three components are not equally relevant across tasks. Namely, when active physically, it may be that employee engagement is best understood by its physical dimension, whereas when involved in a task that is very cognitively demanding, such as the task used in this study, employee engagement is best understood by its cognitive component. The results of this study suggest that although employee engagement is presently conceptualized as a construct with three facets, it is possible that it is most strongly expressed through the facet that matches the task. Thus far, employee engagement has been defined and measured (i.e., Rich et al., 2010 and UWES) as a concept with three relatively equally balanced components; no one to date has suggested that one may be more pertinent or appropriate at any given time. The implications of this study results are that a balanced model may be incorrect – employee engagement may be a construct whose components take on different weights of influence depending on a variety of yet to be identified moderators.

Another possible explanation for the failed fit of the engagement scale to its original structure (i.e., poor fit to a three-factor structure) is that employee engagement is

typically measured as a construct aggregated over time, but captured in a single moment, whereas in this study, employee engagement was measured and captured in a single but very specific moment. That is, this study used Rich et al.'s (2010) measure of employee engagement in a very different time context than for what it was originally designed and validated. When people answer survey items from the Rich et al. scale, they are aggregating their experiences and concluding some *overall* evaluation about their engagement (e.g., I am energetic at work). Therefore, Rich et al.'s scale captures employee engagement over time as a stable attitude or characteristic, so that in the aggregate, one may experience overall levels of high activity without continuous physiological arousal. In contrast, I examined a single, task over a relatively short amount of time, using Kahn's (1990) definition of engagement as a construct that various from moment to moment. Thus, the results from this study provide some support for Kahn 's model – it is possible that engagement really is a moment to moment occurrence and that to capture a single moment where one is engaged physically may require a physically demanding task or that one become physical when being involved in a cognitive or affectively based task. Furthermore, the findings from this study extend Kahn's model by showing that the three factors of the model, physical, emotional, and cognitive, are not equally weighted at all times, as noted above. These findings have significant implications for the further development of the definition and measurement of employee engagement.

Essentially, this study served as a first step in diversifying the methodology used to assess employee engagement and consequently included distal physiological variables to maximize knowledge acquired about the construct. Though the results relating to the

actual physiological measurement of employee engagement were underwhelming, the expansion of the conceptualization of employee engagement as a construct with regards to time and dimensions have significant implications for the field and study of employee engagement.

Limitations

The contributions noted above must be considered in light of the study limitations. The conclusions drawn from the results regarding the physiological measurement of employee engagement are limited by the failed manipulation check, homogenous sample, potentially small sample size, and the exclusion of physiological control variables.

The biggest limitation of this study was the failed manipulation check. Despite expert feedback on the design of the tasks, and research assistants along with a handful of other individuals (who had limited knowledge regarding the study) pilot testing the manipulations, the manipulation check failed. As previously noted, this failure may have been due to poorly worded manipulation check items, lack of power, or to the task itself. It may also be that engagement simply cannot be easily manipulated in the lab, a possibility that future research must consider.

Second, the sample in the current study was a limitation for three main reasons. The first reason is that this was a student sample, rather than a working sample of employees. Employee engagement has thus far been defined as a construct of and about working adults. However, the added control afforded by the experimental design offset any costs that might be associated with using a student sample rather than a field sample. The second, slightly more problematic concern with the sample, though, is the age

restriction of participants. Since research shows that age related health issues can influence physiological factors like heart rate (e.g., Tulppo et al., 1998; Van Heuvelen, et al., 1998), the physiological results from the sample in this study may not generalize to older populations. Lastly, the small sample size may have resulted in low power for the self-reported data, though studies in physiological measurement typically use small samples for within-subjects design, such as used in this study.

A third potential limitation of this study is the exclusion of physiological control variables such as fitness levels, recent alcohol consumption, and smoking habits. Each of these control variables has the potential to influence heart rate and GSR (e.g., Barutcu et al., 2005; Gonzalez, Llorens, Novoa, & Valeriano, 1992; Hayano, Yamada, Sakakibara, Fujinami, Yokoyama, Watanabe, & Takata, 1990; Tulppo et al., 1998; Van Heuvelen, et al., 1998; Wiese, Shlipak, & Browner, 2000). By not statistically controlling for these variables, the true relationship between employee engagement and physiological responses could have been masked by noise. In light of these potentially confounding variables, I attempted to see if I could contact participants after their completion of the study, but was not able to due to compliance with the institutional review board regulations and confidentiality of responses. The lack of control for these health related variables in the current study may not be overly problematic, however, as participants were randomly assigned to conditions such that any effects of these variables should have been evenly distributed. Further, that significant GSR results were achieved without controlling for such individual factors speaks to the robustness of the findings.

Future Directions

Future research should address study limitations and replicate this study's findings by using a better task, a more heterogeneous sample, and controlling for physiological variables. For future tasks, researchers should consider the different factors of employee engagement, possibly using tasks that are physically or emotionally salient. This way, researchers can begin to understand how the physical component of employee engagement is expressed across tasks. It might be that physical engagement does exist and that using a physiological assessment is appropriate for certain types of tasks, but not others.

In addition, researchers should consider diversifying their sample by incorporating a wide range of age groups and fitness levels. Lastly, by incorporating and controlling for physiological variables in the assessment of employee engagement, future researchers stand to gain additional insight into the construct. For example, researchers should consider controlling for physiological factors such as physical activity levels, drug consumption (including alcohol, caffeine, nicotine, or any other illegal or over the counter substance), and age. Such considerations could reduce noise found in the current study and more accurately capture the physiological state of employee engagement.

A future direction in examining the relationship between employee engagement and physiological outcomes should be to investigate the potentially moderating role of job type. In this study, the tasks were sedentary, so any physiological effects would have to have been due to emotional excitations rather than differences in actual physical exertion. Consequently, any physiological differences between the two tasks would have been minimized, as emotional physiological effects are rarely as pronounced as physical physiological effects. This difference creates the possibility for a moderating effect of job

performance on employee engagement. In other words, the relationship between physiological arousal and employee engagement will strengthen as the demands of the job are more physical in nature. For instance, grocery clerks who are engaged in their work (according to Kahn's tripartite conceptualization of employee engagement) should have a stronger physiological reaction to their jobs than administrative assistants who are similarly engaged in their work, but a weaker physiological reaction than aerobics instructors engaged in their work. The moderating role of job type in terms of physical activity may help to explain differences in the physical component of employee engagement that would otherwise go undetected.

Finally, future researchers should consider the relationships between the three facets of employee engagement and how those are expressed over time. As findings from this study preliminarily suggest, the relationship between emotional engagement, physical engagement, and cognitive engagement may be a function of the job type (as mentioned above) or a function of perception over time. For example, if individuals experience engagement a few times a day or week, then their moment-to-moment engagement scores (such as physiological measures) might not correlate with their aggregated perceptions of engagement (like self-reported scales). Of all the findings, this is possibly the most intriguing and the most promising for future understanding of the employee engagement construct because it represents an opportunity to completely transform the way employee engagement is conceptualized and studied. If employee engagement actually depends on *when* you ask employees about it, future studies should attempt to specify what employee engagement looks like over time, from differences in moment-to-moment perceptions to aggregated perceptions over time. By acknowledging

that employee engagement is dynamic over time, we can begin to study how certain factors influence short- versus long-term engagement perceptions, how engagement is expressed over time, and the differences between individuals who perceive short and fluctuating levels of engagement compared to individuals with more stable perceptions of engagement. Given the confusion that is present in the current literature regarding the construct of employee engagement, its antecedents, and its consequences, this new approach could serve as a mechanism for unification and clarity across different conceptualizations of the construct.

Conclusion

This study is novel in its physiological approach to assessing employee engagement. Based on results from the physiological data, it is concluded that the physiological measure was useful in detecting differences between the conditions and that these physiological differences were most apparent in the GSR data. However, the most interesting findings were in regards to the self-report data on employee engagement. The surprising results of the factor analysis shed new light on possible explanations for the non-significant results in the current study. Namely, the type of task and the time sampling used in assessing employee engagement might influence how engagement is expressed in terms of its typical tripartite conceptualization. Therefore, future research should concentrate on the relationships between the factor components of engagement and how those are influenced by job type and duration of engagement.

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LIST OF TABLES

Table 1

Means and Standard Deviations for Demographic Survey Results

Variable	M	SD
Age	20.09 years	2.49
Work Experience	2.47 years	1.05

Note. $N = 32$.

Table 2

Means, Standard Deviations, and Significance Values for Ordering Effects:

Variable	Time One M	SD	Time Two M	SD	*p*
Engaged					
GSR: Minimum	8.12	3.45	10.23	2.99	.08
GSR: Mean	10.17	4.13	12.11	3.34	.157
GSR: Maximum	13.51	5.95	16.03	5.41	.23
HR: Minimum	42.43	16.46	43.74	23.01	.86
HR: Mean	74.16	14.42	80.23	12.62	.22
HR: Maximum	149.22	39.54	156.43	33.43	.59
Unengaged					
GSR: Minimum	9.35	4.39	7.40	2.81	.14
GSR: Mean	10.99	4.85	9.59	2.77	.32
GSR: Maximum	14.63	7.49	14.45	5.57	.94
HR: Minimum	43.19	15.53	47.83	13.44	.38
HR: Mean	72.62	11.21	82.30	14.03	.05
HR: Maximum	149.84	41.21	159.80	28.71	.43

Note: $N = 13$ for Time 1; $N = 18$ for Time 2

.

Table 3

Means and Standard Deviations for Study Variables

Variable	Minimum (*SD*)	Mean (*SD*)	Maximum (*SD*)
Unengaged Self-Report		3.38 *(.46)*	
Engaged Self-Report		3.67 *(.38)*	
Unengaged GSR	8.21 (*3.62)*	10.18 *(3.78)*	14.52 *(6.32)*
Unengaged HR	45.88 *(14.29)*	78.24 *(13.61)*	155.62 *(34.22)*
Engaged GSR	9.34 *(3.31)*	11.30 *(3.76)*	14.97 *(5.68)*
Engaged HR	43.19 *(20.02)*	77.68 *(13.5)*	153.41 *(35.66)*

Note: N = 32

Table 4

Correlations between physiological assessments and Rich physiological sub-scale self-report:

Variable	Rich physiological self-report (engaged)	Rich physiological self-report (unengaged)
Engaged		
GSR: Min	-.07	-.06
GSR: Mean	-.08	-.07
GSR: Max	-.06	-.05
HR: Min	.02	.04
HR: Mean	.31	.34
HR: Max	-.27	-.24
Unengaged		
GSR: Min	.16	.16
GSR: Mean	.16	.17
GSR: Max	.04	.09
HR: Min	.24	.23
HR: Mean	.27	.32
HR: Max	-.28	-.27

Table 5

Correlations between mean physiological assessments and full Rich self-report scale:

Variable	Rich self-report (engaged)	Rich self-report (unengaged)
Engaged		
GSR: Min	-.02	-.15
GSR: Mean	-.03	-.16
GSR: Max	-.07	-.18
HR: Min	.16	.14
HR: Mean	.36	.29
HR: Max	-.30	-.33
Unengaged		
GSR: Min	.21	.08
GSR: Mean	.22	.08
GSR: Max	.07	-.03
HR: Min	.16	.12
HR: Mean	.31	.23
HR: Max	-.07	-.22

APPENDICES

Appendix A

Recruiting Information

Physiology, Personality, and the use of Facebook in Hiring Practices

Facebook is the most popular social networking site in the United States. As such, companies are beginning to use Facebook as a means of attracting new talent, selecting applicants, and making other hiring/firing decisions. A local outdoor equipment store has asked CSU researchers to develop a reliable way to assess the personalities of potential employees by using Facebook. Our team has created two systems with which to review and rank these potential employees. As a participant in this study, one of your jobs will be to use Facebook along with our newly created personality assessment.

In addition to assessing the personalities of potential job candidates, we are also interested in your personality and individual physiology. We want to know if there are physiological differences based on personality type. For example, outgoing individuals might demonstrate a consistently higher heart beat than shy individuals. Therefore, in this study, we'll measure your heart rate and skin response. No worries – anyone can participate, even those with a pre-existing heart condition (such as a heart murmur).

Appendix B

Department of Psychology
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(970) 491-6363
www.colostate.edu/Depts/Psychology/

Dear Participant,

Thanks for your interest in this study, entitled, "Physiology, Personality, and the use of Facebook in Hiring Practices." My advisor, Principal Investigator: Zinta Byrne, Ph.D. zinta.byrne@colostate.edu 970-491-6982, and I, Janet Weidert, janet.weidert@colostate.edu, Co-Principal Investigator, are conducting one study with two parts. The first part of the study measures personality from a physiological perspective. The second part of the study is a pilot study to learn how Facebook can be used in hiring practices by organizations.

What is This Study?

The purpose of the first part of the study is to understand the physiological differences between personality traits. You will be rating your own personality traits and the personality traits of others. The physiological measures are heart rate and galvanic skin response (GSR). While you probably know what heart rate is, you might be wondering what is GSR. GSR measures very minor electric activity on the surface of your skin. Our goal is to see if there are any fundamental differences (on a physiological level) between different personalities, by using your heart rate and the electronic activity on the surface of your skin.

The purpose of the second part of the study is to understand how Facebook can be used by organizations to hire potential employees. Researchers here at CSU have created a pilot program to do just that, and you will be helping us to determine how easy the program is to use.

How Long Will it Take And What Will I Do?

This study will take 2 hours, and will occur in a single session. You will complete your participation by filling out a few personality questionnaires and using Facebook to rate job candidates. Afterwards, you will be asked to complete a series of questionnaires regarding your experience. During the task, some sticky tape, like a band aid, will be attached to your finger and ankles to measure your heart rate and GSR. The task should take no longer than 2 hours. Be prepared, however, to stay for the full 2 hours.

Why Should I Participate – Are There Benefits?

Your participation will help us learn about personality and what organizations are looking for in job applicants, as well as testing a new potential tool for selection. You may also benefit from participating by thinking about what content you post on Facebook. In addition, you will receive 2 hours of research credit. Anyone can participate in this study; even someone with a heart murmur or other heart condition.

Potential Risks in Participating

There are no known risks to you for participating. Although it is not possible to foresee all potential risks and research procedures, the researchers have taken reasonable safeguards to minimize any known and

potential, but unknown, risks. There are no known health risks with having your skin response and heart rate measured, even for individuals with pre-existing heart conditions.

Liability

The Colorado Governmental Immunity Act determines and may limit Colorado State University's legal responsibility if an injury happens because of this study. Claims against the University must be filed within 180 days of the injury.

Your Confidentiality is Important!

To ensure confidentiality, you will not be asked to provide any identifying information. Your consent form will not be connected to your research results in any way. All information collected in the study is for research purposes only. If published later, you cannot be identified.

Questions Before Participating?

If you have questions about the study before volunteering, please feel free to contact the researchers: Janet Weidert, janet.weidert@colostate.edu, or Zinta Byrne, Ph.D., zinta.byrne@colostate.edu. Also feel free to contact one of us should you have questions after or during participation. Any contact you initiate will remain confidential. If you have questions about your rights as a volunteer in this research, contact Janell Barker, Human Research Administrator, at 970-491-1655.

Your signature acknowledges that you have read the information stated and willingly signed this consent form. Your signature also acknowledges that you have received, on the date signed, a copy of this document containing 2 pages.

_____ _____

Your Signature Date

_____

Your Printed Name

_____ _____

Signature of Research Staff Date

Obtain your parent's permission ONLY if you are under 18 years of age.

PARENTAL SIGNATURE FOR MINOR

As parent or guardian I authorize _____ (print name) to become a participant for the described research. The nature and general purpose of the project have been satisfactorily explained to me by _____ and I am satisfied that proper precautions will be observed.

_____

Minor's date of birth

_____
Parent/Guardian name (printed)

_____ _____
Parent/Guardian signature Date

Appendix C

Task Engagement (Rich et al., 2010)

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

Using the scale above, please indicate the extent to which you agree or disagree with each of the following statements by circling your response on a scale from 1 (strongly disagree) to 5 (strongly agree) that most closely corresponds with your opinion.

1.	I worked with intensity on my task	1	2	3	4	5
2.	I exerted my full effort to my task	1	2	3	4	5
3.	I devoted a lot of energy to my task	1	2	3	4	5
4.	I tried my hardest to perform well on my task	1	2	3	4	5
5.	I strove as hard as I could to complete my task	1	2	3	4	5
6.	I exerted a lot of energy on my task	1	2	3	4	5
7.	I was enthusiastic about my task	1	2	3	4	5
8.	I felt energetic about my task	1	2	3	4	5
9.	I was interested in my task	1	2	3	4	5
10.	I was proud of my task	1	2	3	4	5
11.	I felt positive about my task	1	2	3	4	5
12.	I was excited about my task	1	2	3	4	5
13.	My mind was focused on my task	1	2	3	4	5
14.	I paid a lot of attention to my task	1	2	3	4	5
15.	I concentrated on my task	1	2	3	4	5
16.	I focused a great deal of attention on my task	1	2	3	4	5
17.	I am absorbed by my task	1	2	3	4	5
18.	I devoted a lot of attention to my task	1	2	3	4	5

Conscientiousness (from International Personality Item Pool; IPIP)

For the following statements, indicate how accurate the statement describes you. I…	Very Inaccurate	Moderately Inaccurate	Neither accurate nor inaccurate	Moderately Accurate	Very Accurate
Am always prepared	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Waste my time	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Pay attention to details	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Find it difficult to get down to work	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Get chores done right away	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Do just enough work to get by	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Carry out my plans	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Don't see things through	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Make plans and stick to them	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Shirk my duties	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Perfectionism (from International Personality Item Pool; IPIP)

For the following statements, indicate how accurate the statement describes you. I…	Very Inaccurate	Moderately Inaccurate	Neither accurate nor inaccurate	Moderately Accurate	Very Accurate
Continue until everything is perfect	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Want every detail taken care of	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Want everything to be “just right”	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Want things to proceed according to plan	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Demand perfection in others	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Keep a sharp eye on others' work	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Expect dedicated work	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

from others					
Am not bothered by messy people	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Am not bothered by disorder	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Openness to Experience (from International Personality Item Pool; IPIP)

For the following statements, indicate how accurate the statement describes you. I…	Very Inaccurate	Moderately Inaccurate	Neither accurate nor inaccurate	Moderately Accurate	Very Accurate
Believe in the importance of art	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Have a vivid imagination	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Am not interested in abstract ideas	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Avoid philosophical discussions	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Tend to vote for liberal political candidates	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Do not enjoy going to art museums	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Carry the conversation to a higher level	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Do not like art	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Enjoy hearing new ideas	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Tend to vote for conservative political candidates	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Self-Efficacy (from International Personality Item Pool; IPIP)

For the following statements, indicate how accurate the statement	Very Inaccurate	Moderately Inaccurate	Neither accurate nor inaccurate	Moderately Accurate	Very Accurate

describes you. I…					
Complete tasks successfully	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Misjudge situations	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Handle tasks smoothly	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Am sure of my ground	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Come up with good solutions	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Don't understand things	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Excel in what I do	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Have little to contribute	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Don't see the consequences of things	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Know how to get things done	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Demographic Information:

Age in years as of last birthday:

Gender: ☐ Male ☐ Female

Race or Ethnicity:
☐ Asian/Pacific Islander
☐ African American
☐ Latin American/Hispanic
☐ Native American Indian
☐ White/Caucasian
☐ Other

How much work experience do you have?

☐ < 1 year ☐ 1 - 3 years ☐ Between 3 - 6 years ☐ Between 6 - 9 years ☐ > 9 years

Appendix D

Facebook Task A (engaging)

Facebook is the most popular social networking site in the United States. Whether appropriate or not, companies are beginning to use Facebook as a means of attracting new talent, selecting applicants, and making other hiring/firing decisions.

A local outdoor equipment store has asked CSU researchers to develop a reliable way to assess the personalities of potential employees by using Facebook. Our team has created two systems with which to review and rank these potential employees.

Directions:

Below you will find a job description and series of personality criteria. There are four applicants applying for the position. Your job is to pick two applicants and rank each applicant based on how well he or she meets the criteria. *Your answers are untimed and WILL NOT be judged for accuracy.* We do value your accurate judgment on this task, so please take your time to do it well.

Job Description:

This is a sales position for outdoor sports equipment. Therefore, we need someone who is friendly, outgoing, and open to new experiences. In addition, the person should show an interest or knowledge in camping, hiking, climbing, boating, or other outdoor activities.

Criteria for rating:

Applicant #1: (name of applicant) _____

1. Please take several minutes to look through the applicant's page, including their pictures, friends, activities, groups, etc. Please write a few sentences based on what you saw. Do you have any strong impressions or doubts about this person's ability to work as an outdoor equipment sales person? Please support your conclusions with examples from their Facebook page.

Applicant #2: (name of applicant) _____

1. Please take several minutes to look through the applicants page, including all their pictures, friends, activities, groups, etc. Please write a few sentences based on what you saw. Do you have any strong impressions or doubts about this person's ability to work as an outdoor equipments sales person? Please support your conclusions with examples from their Facebook page.

Facebook Task B (unengaging)

Facebook is the most popular social networking site in the United States. Whether appropriate or not, companies are beginning to use Facebook as a means of attracting new talent, selecting applicants, and making other hiring/firing decisions.

A local outdoor equipment store has asked CSU researchers to develop a reliable way to assess the personalities of potential employees by using Facebook. Our team has created two systems with which to review and rank these potential employees.

Directions:

Below you will find a job description and series of personality criteria. There are two applicants applying for the position. Your job is to rank each applicant based on how well they meet the criteria. *Your answers will be judged for accuracy. Though you will not be timed, efficiency is important as you must complete both ratings before the end of the session.*

Job Description:

This is a sales position for outdoor sports equipment. Therefore, we need someone who is friendly, outgoing, and open to new experiences. In addition, they should show an interest or knowledge in camping, hiking, climbing, boating, or other outdoor activities.

Criteria for rating:

Applicant #1: (name of applicant) _____

1. How many words are in the candidate's "about me" section?
    a. _____
2. Based on the number of words, do you think the candidate's "about me" section reflects an interest in the outdoors?
    a. Yes
    b. No
3. How many groups has the candidate joined?
    a. 0-5
    b. 6-10
    c. 11-15
    d. 15-20
    e. 20-25
    f. 25-30
    g. More than 30
4. How many of those groups have to do with camping or the outdoors?
    a. 0-5
    b. 6-10
    c. 11-15
    d. 15-20
    e. 20-25
    f. 25-30
    g. More than 30
5. How many activities does the candidate list on their "info" page?

    a. 0-5
    b. 6-10
    c. 11-15
    d. 15-20
    e. 20-25
    f. 25-30
    g. More than 30
6. How many of those activities have to do with camping or the outdoors?
    a. 0-5
    b. 6-10
    c. 11-15
    d. 15-20
    e. 20-25
    f. 25-30
    g. More than 30
7. Is the candidate over the age of 18?
    a. Yes
    b. No
8. How many pictures is the candidate tagged in?
    a. 0-30
    b. 31-60
    c. 61-90
    d. 91-120
    e. 121-150
    f. 151-180
    g. 181-210
    h. 211-240
    i. 241-270
    j. 271-300
    k. More than 300
9. Out of the first 100 tagged pictures (or less if the candidate does not have 100 tagged pictures), in how many pictures is the candidate outside?
    a. 0-10
    b. 11-20
    c. 21-30
    d. 31-40
    e. 41-50
    f. 51-60
    g. 61-70
    h. 71-80
    i. 81-90
    j. 91-100
10. Where does the candidate live?
    a. _____
11. How many Facebook albums does the candidate have?
    a. 0-1

b. 2-3
c. 4-5
d. 6-7
e. 8-9
f. 10 or more

12. How many of the candidate's photo albums are set outdoors?
    a. 0-1
    b. 2-3
    c. 4-5
    d. 6-7
    e. 8-9
    f. 10 or more

Appendix E

Debriefing: Thank you for your participation!

Though you were told otherwise, the real purpose of this study was to measure the relationship between engagement and physiological factors. Engagement is simply how involved someone is in a given task. In this study, the physiological factors were your heart beat and skin response. You participated in two tasks, one that attempted to increase your engagement by making the task seem challenging and interesting, and one that tried to decrease your engagement by making the task seem meaningless. We could not tell you that the study was about engagement, because we were worried that some participants would change their behavior if they knew we were monitoring how involved in the task they were. That is, knowing that we are trying to measure engagement might have indirectly led you to either try harder, or feel bored. We expect that participants' physiological factors will differ depending on their state of engagement. If you would like to learn more about employee psychology, please reference Module 23 of your PSY100 textbook. Information about motivation, which is related to employee engagement, can be found on page 356 of your textbook.

This study will be on going for the remainder of the semester, so we ask that you **please do not discuss this study** with other students. Revealing information about the study to students who will later participate will affect the study results, and we hope that these data will make an important contribution in helping to further our understanding of employee engagement and physiological factors associated with it. Your support in our efforts to keep the true purpose of the study a secret is greatly appreciated; our data is worthless if participants try to either fake engagement or fake being unengaged.

You should also understand how your data will be used. Your responses on the measures will be combined with the responses of all other participants to examine the hypothesized relationships. Your name has not been recorded with your data, and there will be no way for anyone to trace your responses back to you as an individual. Should you choose to withdraw your data, you have the right to do so and should inform the co-principal investigator, Janet Weidert at weidjm21@lamar.colostate.edu, or principal investigator, Zinta Byrne, Ph.D. at Zinta.Byrne@colostate.edu, as soon as possible. If you decide to withdraw your data, you will still receive the full amount of research credit designated to this study, which is two research credits.

If you would like to receive a summary of the results of the study, please fill out the information on the next page of this form and return it to the Research Assistants. In the meantime, if you have any questions or concerns about the study, please contact Janet Weidert at weidjm21@lamar.colostate.edu or Zinta Byrne, Ph.D. at Zinta.Byrne@colostate.edu.

You should know that having your heart rate monitored and your skin response measured has no lasting effect on you at all. These measures in no way affect or change your skin or heart rate. They are not unlike going to the Doctor and having him or her listen to your heart and touch your arm. However, if you experienced any distress during the course of this study or feel distressed now, afterwards, and would like to speak to a counselor, please contact the CSU University Counseling Center at 970-491-6053.

Thank you very much for your participation in this study, and please do not discuss it with any other students so that we can protect the integrity of our results. Retain this debriefing form for your reference.

Lastly, if this research experience drew your interest in the topic area, please let Janet Weidert or Dr. Byrne know of your interests so that we may consider your involvement as a research assistant in future research studies. You may indicate your interests in becoming an RA on the following form.

Please send a copy of the feedback study results to me at:

Name: _____

Email: _____

I am interested in this research topic and would like to be considered for a possible position as a research assistant sometime in the future. Please keep my name and contact information handy.

Name: _____

Email and/or phone number: _____