

**DEMANDING AND SUPPORTIVE TRANSFORMATIONAL  
LEADERSHIP BEHAVIORS AND FOLLOWER SLEEP  
OUTCOMES: A MULTILEVEL MODERATED SERIAL  
MEDIATION MODEL**

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by

Claire Elyse Burnett

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**DEMANDING AND SUPPORTIVE  
TRANSFORMATIONAL LEADERSHIP BEHAVIORS AND  
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MODERATED SERIAL MEDIATION MODEL**

Approved by:

Dr. Keaton Fletcher, Advisor  
School of Psychology  
*Georgia Institute of Technology*

Dr. Kimberly French  
School of Psychology  
*Georgia Institute of Technology*

Dr. Michael Hunter  
Department of Human Development and Family  
Studies  
*The Pennsylvania State University*

Date Approved: November 28, 2022

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## LIST OF SYMBOLS AND ABBREVIATIONS

JD-R	Job Demands-Resources Theory.
TL	Transformational Leadership.
U.S.	United States.
MCFA	Multilevel Confirmatory Factor Analysis.
CFI	Comparative Fit Index.
TLI	Tucker Lewis Index.
SRMR	Standardized root mean square residual.
RMSEA	Root mean squared error of approximation.
<i>df</i>	Degrees of freedom.
MLM	Multilevel modeling.
<i>SD</i>	Standard deviation.
<i>CI</i>	Confidence interval.

## SUMMARY

Transformational leadership behaviors in the workplace are commonly studied as a form of support and are associated with positive follower health outcomes. However, when parsed apart into its facets, transformational leadership may also act as a demand for followers that negatively impacts them daily. Drawing from the Job-Demands Resources (JD-R) Theory (Bakker & Demerouti, 2007), this study investigated the facets of transformational leadership (Bass, 1985) acting differentially to influence follower sleep outcomes—first through the mediation of fatigue and then through performance of sleep hygiene behaviors—all at the daily level. The supportive facets of transformational leadership were thought to increase sleep quality and quantity at the daily level, while the demanding facets were proposed to decrease them. Because of the heightened response to stressors that neurotic individuals exhibit, neuroticism was explored as a moderating mechanism on the relationship between leader demands and fatigue. This study used a sample of 127 full-time, working adults and experience sampling methods over a 10-day period in order to measure these variables at the daily level. Ultimately, the proposed facets of supportive and transformational leadership were supported, but the proposed direct, mediating, and moderating relationships were not. This study contributes to theory in its expansion of transformational leadership theory—pointing to a demanding and a supportive factor. Further research is warranted to explore the timeframe during which relationships between leader behavior and follower health outcomes unfold.

## **CHAPTER 1. BACKGROUND AND LITERATURE REVIEW**

Sleep-related outcomes act as important contributors to outcomes in the workplace such as job attitudes, safety, and organizational commitment (Litwiller et al., 2017). To better understand the link between job demands and employee sleep in the workplace, I draw upon the Job Demands-Resources Theory (Bakker & Demerouti, 2007). This model posits that as demands increase, individuals experience strain in the form of reduced health, energy, or burnout (e.g., Bakker et al., 2003b; Hakanen et al., 2006); whereas job resources lend themselves to achieving work goals, reducing job demands and associated costs, or lending toward personal growth, learning, and development.

One work characteristic that may act as either a demand or a resource on followers, and thus a key predictor of sleep outcomes, is leadership. Leaders are able to pose challenges and develop positive, negative, or a mixture of both positive and negative relationships with their followers. As important organizational figures, leaders can either increase or decrease cognitive demand, workload, and emotional strain of followers, even via daily interactions (Simbula, 2010).

One specific and widely used theory of leadership, transformational leadership theory (Bass, 1985), provides necessary insight into the relationships between leader behavior and follower sleep outcomes because transformational leadership can act as a demand or resource (Loke, 2001; Moore, 1976). Several studies have demonstrated the differential effects of the facets of transformational leadership (e.g., Hobman, Jackson,

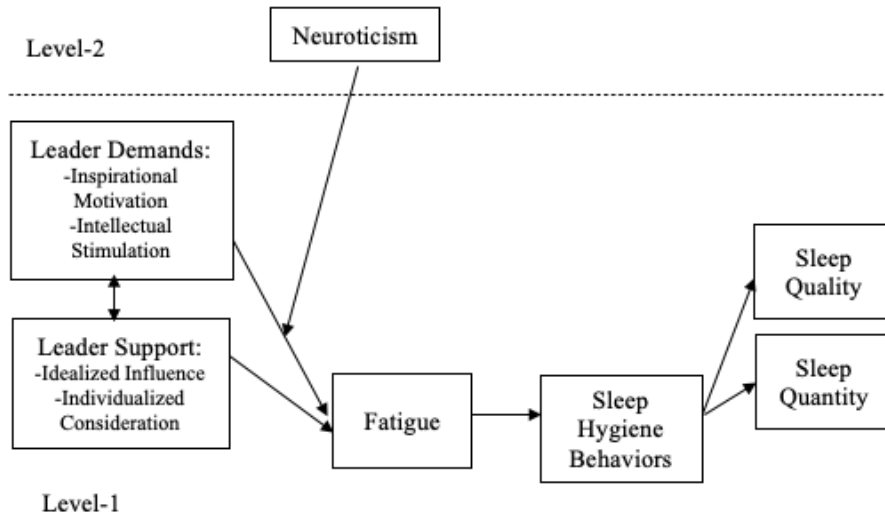
Jimmieson, & Martin, 2011) on job satisfaction and supervisor-rated job performance, yet previous studies examining transformational leadership and follower health outcomes fail to consider the subdimensions of transformational leadership. Some of these facets involve posing challenges to followers which can create short-term strain; other facets of transformational leadership might solely act as support to followers, providing them with resources to cope with stressors.

Transformational leadership's differential impacts on follower sleep might be particularly apparent on the daily level. Research has shown that transformational leadership's impacts on followers can fluctuate from day to day (Breevarrt and Bakker, 2018), as can sleep within an individual (Dillon, Lichstein, Dautovich, Taylor, Riedel, & Bush, 2015). Because transformational leadership's impact on followers and an individual's sleep can vary from day to day, the relationship between the associated variables should be examined at the daily level.

Key mediators might explain the tenuous link between leadership and sleep. Fatigue can be viewed as a response to internal or external demands and can result in a lack of motivation as well as an awareness of one's declining ability to perform mental or physical activities (Aaronson, Teel, Cassmeyer, Neuberger, Pallikikkathayil, Pierce, Press, Williams, & Wingate, 1999). When fatigue is high, energy and motivation are low, likely resulting in a reduced willingness to participate in healthy sleep hygiene behaviors and instead promoting mindless activity (e.g., watching tv before bed) due to the mental and physical degradation that result from fatigue (Techera, Hallowell, Stambaugh, Littlejohn, 2016).

Because perceptions of job demands and job resources may vary, certain individual differences likely affect the impact of transformational leadership on follower sleep. Neuroticism, in particular, likely strengthens the relationship between leader demands and follower fatigue. Neurotic individuals tend to respond more negatively to stressors and have stronger reactions evoked from stressors as compared to their less neurotic counterparts (Thompson, 2008). Even upon exposure to the same stressors, neurotic individuals tend to demonstrate higher negative reactivity and higher perceptions of distress as compared to their less neurotic counterparts (Bolger & Schilling, 1991). Within the context of the workplace, leader demands may therefore be perceived as more distressing and ought to evoke stronger reactions among highly neurotic individuals as compared to their less neurotic counterparts, even if those leadership demands are the same behaviors.

Although the relationships between leadership and sleep outcomes have been thoroughly established, there is a missing link as to *why* these relationships exist (Munir & Nielsen, 2009). Specifically, this study intends to examine *how* and *for whom* leadership behaviors impact sleep outcomes. By drawing on Job-Demands Resources Theory (Bakker & Demerouti, 2007) this study aims to elucidate the missing link between leadership support and demands and subsequent follower sleep outcomes in the workplace via fatigue and sleep hygiene behaviors, and how neuroticism alters these relationships (see Figure 1).



**Figure 1 - Proposed moderated serial mediation model with days (level-1) nested within persons (level-2).**

## 1.1 Sleep and Transformational Leadership

### 1.1.1 Why is Sleep Important?

Longstanding poor sleep quality and quantity can eventually lead to negative long-term health outcomes including memory loss, obesity, and hypertension (Ganster, Crain, & Brossoit, 2017). Despite these linkages, the CDC reports that the average American adult does not get the seven to eight hours of sleep recommended by American Academy of Sleep Medicine and the Sleep Research Society (Liu, Wheaton, Chapman, Cunningham, Lu, Croft, 2014; Watson, Badr, Belenky, Bliwise, Buxton, Buysse, Dinges, Gangwisch, Grandner, Kushida, Malhotra, Martin, Patel, Quan, & Tasali, 2015a; Watson et al., 2015b). Sleep quality and quantity have long been touted as critical antecedents for both short-term and long-term wellbeing (e.g., Shan, Ma, Xie, Yan, Guo, Bao, Jackson, Hu, & Liu, 2015; Bubu, Brannick, Mortimer, Umasabor-Bubu, Sebastião, Wen, Schwartz, Borenstein, Wu, Morgan, & Anderson, 2017). While sleep quantity measures total duration of sleep, sleep

quality adds important components such as awakenings during the night and duration of time taken to fall asleep; both of these measures are related to critical health outcomes such as health, depression, wellbeing, and affect (Pilcher, Ginter, & Sadowsky, 1997).

In addition to its relationships with wellbeing outcomes, sleep also has shown relationships with workplace outcomes; it can act as both an antecedent to, and an outcome of, workplace characteristics. As an antecedent to work outcomes, daily sleep has shown a positive relationship with daily work engagement and energy levels (Kühnel, Zacher, de Bloom, & Blewlow, 2017). In addition, sleep-related outcomes act as important contributors to job attitudes, safety, and organizational commitment (Litwiller et al., 2017). As an outcome itself, sleep can be impacted by many organizational variables such as perceived stress levels, shift work, and workload (de Lange, Kompier, Taris, Geurts, Beckers, Houtman, & Bongers, 2009; Zhang, Punnett, McEnany, & Gore, 2016). It is also likely the case that organizational leadership is another important antecedent of sleep outcomes, as leadership has been demonstrated to act as a key antecedent to follower health outcomes (Jacobs, 2019), including the development of insomnia (Jansson & Linton, 2006).

Sleep hygiene behaviors explain *how* leader behaviors impact followers' subjective sleep outcomes. Sleep hygiene, in fact, is argued as one of the most important variables that affects sleep quality (Yazdi, Loukzadeh, Moghaddam, & Jalilolghadr, 2016). In particular, supportive supervisor behaviors are critical to employees' sleep quality and reduced sleep-related impairment (Sianoja, Crain, Hammer, Bodner, LoPresti, & Shea, 2020).

### *1.1.2 Job Demands-Resources Theory*

To better understand the link between leadership and follower sleep outcomes, I draw upon the JD-R Theory (Bakker & Demerouti, 2007). This theory examines both demands on an individual and the resources available to deal with those demands and work toward goal achievement. Job demands are physical, psychological, social, or organizational job characteristics that require sustained physical and/or psychological effort and are subsequently associated with physiological and/or psychological costs and health impairment (i.e., strains). These demands act as stressors and ultimately produce follower strains (Ganster & Rosen, 2013). Job resources, on the other hand, are physical, psychological, social, or organizational job characteristics that lend themselves to achieving work goals, reducing job demands and associated costs, or leading toward personal growth, learning, and development.

Job demands and resources independently trigger two processes: a health impairment process and a motivational process, respectively. This differential effect is due to loss of energy resources and use of effort when individuals encounter job demands, and fulfillment of needs when an individual acquires job resources (Bakker, 2011). JD-R posits that as demands increase, employees experience strain in the form of reduced health, energy, or burnout (e.g., Bakker, Demerouti, & Schaufeli, 2003b; Hakanen et al., 2006). This is because physical, psychological, or organizational characteristics of a job that require sustained physical or psychological effort are often associated with physiological or psychological costs (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). Job demand stressors in the context of work can result in numerous negative outcomes (e.g., fatigue, perceived strain, and negative affective states) (Jacobs, 2019). For example, in a study of



call center employees Bakker et al. (2003) demonstrated that the most important predictors of health problems were job demands (i.e., emotional demands, work pressure, task changes). On the other hand, as job resources increase, employees ought to experience an increase in motivation and energy (Parzefall & Hakanen, 2010). This is because job resources act both to reduce job demands and their associated costs and also work to aid achievement of work goals. For example, Christian, Garza, and Slaughter (2011) meta-analytically reaffirmed that job resources (i.e., autonomy, high quality relationship with supervisor, transformational leadership) are the most important predictors of employee work engagement autonomy.

Fouquerau et al. (2019) used JD-R to examine how job demands specifically influence sleep, finding that emotional dissonance and workload were negatively related to sleep quality and, in turn, linked to increased emotional exhaustion. In addition, Hülshager and colleagues (2018) used both JD-R, and a similar, resources-based theory, Conservation of Resources Theory (Hobfoll, 1989), to examine fluctuations in daily workload as it relates to daily sleep quality and mindfulness, finding that job demands were negatively related to sleep quality and positively related to levels of fatigue. Together, these support the theoretical link between workplace demands and employee sleep outcomes.

As important organizational figures, leaders can either increase or decrease cognitive demand, workload, and emotional strain of followers via daily interactions. Leaders are able to pose challenges and develop either positive or negative relationships with their followers. Certain leadership behaviors can result in negative outcomes for followers. For example, previous research has demonstrated that abusive supervisor behaviors (e.g., belittling followers, public criticism, coercion, lack of consideration) act

as a demand and ultimately result in follower psychological distress, job tension, and emotional exhaustion (Restubog, Scott, & Zagenczyk, 2011; Harvey, Stoner, Hochwarter, & Kacmar, 2007). Though leadership can act as a demand, it can also act as a resource. Hentrich and colleagues (2017) demonstrated transformational leadership's role in reducing job demands and enhancing personal resources of followers in order to reduce cognitive and emotional strain of followers. The JD-R Theory is critical in explaining why leadership demands and support act as antecedents to follower health behaviors and follower sleep outcomes. Transformational leadership, in particular, may have a more nuanced relationship with follower wellbeing than the positive relationship found by Hentrich and colleagues (2017).

### 1.1.3 *Transformational Leadership.*

One of the most frequently used and dominant models of leadership is transformational leadership theory (Mhatre & Riggio, 2014). Transformational leadership (Bass, 1985) is founded upon the idea of leaders inspiring and empowering followers, while also providing them with individualized attention and challenges to help them grow. Transformational leadership is a multidimensional construct made up of four primary factors: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration (Bass, 1985). *Idealized influence* is the affective, moral component of transformational leadership, and is largely concerned with what followers believe of their leader and what followers see their leader do. *Inspirational motivation* concerns setting high goals for followers, inspiring confidence, possessing a clear vision, having strong communication skills, being optimistic, and being enthusiastic. *Intellectual stimulation* revolves around a leader promoting creativity and innovation via soliciting

ideas from followers or encouraging/using unique problem-solving skills. Finally, *individualized consideration* is concerned with leaders creating a supportive climate, developing an understanding of what motivates individuals within a team, coaching and mentoring, and providing attention when needed (Bass, 1985).

Transformational leadership has demonstrated positive relationships with follower performance and satisfaction outcomes (Dumdum, Lowe, & Avolio, 2002). However, previous studies have demonstrated a seemingly anomalous link from transformational leadership to reduced follower sleep quality (Munir & Nielsen, 2009; Nielsen & Daniels, 2011). Specifically, Munir and Nielsen (2009) found that transformational leadership was negatively related to sleep quality when it was cross-sectionally measured. At both time one and time two (measured 18-months apart), there was a negative relationship between followers' perceptions of transformational leadership and sleep quality. Contrarily, when examined longitudinally, the relationship between transformational leadership behaviors and follower sleep quality was positive (Munir & Nielsen, 2009). The authors suggested that perhaps transformational leadership initially relates to reduced sleep quality because of the initial perception of leader behaviors that develop or challenge followers as demanding behaviors. Followers might perceive their supervisors' difficult goals and challenges to uniquely solve problems as demands; this may serve as a stressor resulting in negative impacts on short-term well-being, including sleep quality. Munir and Nielsen's (2009) finding of a positive relationship between transformational leadership and sleep quality longitudinally suggests that over extended periods of time, followers' resources (i.e., confidence, self-efficacy) are bolstered, and the ambitious goals and challenges set forth by a transformational leader may no longer seem as daunting nor as taxing to follower

well-being. However, further research must be done to investigate potential underlying mechanisms.

One potential underlying mechanism warranting further attention is the differential relationships of the different facets of transformational leadership on the daily level. In fact, Avolio, Bass, and Jung (1999) called for research that does not singularly use a global measure of transformational leadership, but rather considers each component of transformational leadership in order to investigate possible differential relationships. Previous studies examining transformational leadership and follower health outcomes fail to consider the subdimensions of transformational leadership, some of which involve posing challenges to followers that, in turn, may create short-term strain; other facets of transformational leadership might solely act as support to followers, providing them with resources to cope with stressors. In fact, no empirical research has investigated the four facets of transformational leadership and their individual relationships to follower sleep outcomes.

Despite the high correlations of the four facets of transformational leadership, (Bass, 1985), several studies have demonstrated the differential effects of the facets (often labeled under different construct names). For example, Hobman, Jackson, Jimmieson, & Martin (2011) examined a sample of healthcare employees and their supervisors and found that while intellectual stimulation, supportive leadership, and personal recognition exhibited positive relationships with job satisfaction, inspirational communication and vision leadership did not demonstrate any significant effects. Additionally, Hoffmeister et al. (2014) utilized relative weights analysis to look at the unique influences of the facets of transformational leadership on safety outcomes among a population of 1,167 construction

pipefitters and plumbers. The results of this study suggested that idealized attributes and behaviors demonstrated significant prediction of safety outcomes, whereas individualized consideration and active management-by-exception did not. Specific facets of transformational leadership have shown different links to work outcomes including job satisfaction and productivity. Chiok Foong Loke (2001) examined employee outcomes of registered nurses in general wards, intensive care units, and coronary care units and found that while encouragement from supervisors demonstrated the lowest correlation with job satisfaction and organizational commitment among nurses, it showed the highest correlation of the facets with productivity. In contrast, challenging the process demonstrated a U-shaped relationship with productivity and job satisfaction, suggesting that too much emphasis on this behavior may introduce too much challenge. These demonstrated differential effects of the four facets of transformational leadership may also translate to wellbeing outcomes of followers, where some of the facets contribute in a positive way to follower sleep outcomes and others result in negative sleep outcomes.

Moore (1976) suggested that leadership behaviors that focus on the development of followers place greater demands on followers. Because of this, these behaviors may require an employee's achievement of certain developmental levels in order for these demands to be embraced, rather than perceived as a demand. These developmental challenges may instead be perceived as job demands under JD-R, resulting in the depletion of resources, including energy levels. Within transformational leadership theory, some facets define behaviors that focus on development and high goal setting (i.e., inspirational motivation, intellectual stimulation), and therefore might be perceived as demands by followers as compared to those that focus more on support and consideration of needs (i.e.,

individualized consideration, idealized influence). In turn, within the context of JD-R, individualized consideration and idealized influence would act to provide job resources in the form of support and provide a buffer from resource depletion and decreases in energy levels. The differential facet relationships with follower health behaviors may be particularly poignant on daily levels due to the variability in both leader behaviors and health behaviors.

#### *1.1.4 Daily Measures of Sleep and Transformational Leadership.*

In their 2014 annual review, Bakker, Demerouti, and Sanz-Vergel called for future research on outcomes of job demands and job resources on the daily and momentary level. In addition, Demerouti and Bakker (2011) called for further explanation of proximal and distal processes and health indicators within the context of JD-R. Further research in daily fluctuations of job demands and resources, as well as fluctuations in follower perceptions of these resources, is needed in order to further explain the proximal processes and health indicators under JD-R.

Sleep can be highly variable both across and within individuals—in fact sometimes being more variable within a person than across individuals (Dillon, Lichstein, Dautovich, Taylor, Riedel, & Bush, 2015). In addition, intra-individual variability in sleep has demonstrated relations to both high psychosocial stress and high negative affect (Mezick, Matthews, Hall, Kamarck, Buysse, Owens, & Reis, 2009). Because of the high intra-individual variability in sleep outcomes, it is important that potential fluctuations in follower sleep quality and quantity are captured at the daily level. In addition, in order to capture potential fluctuations of transformational leadership behaviors and subsequent

sleep related outcomes, it is important to measure within person differences in sleep and transformational leadership behaviors at the daily level.

The function of transformational leadership can shift from day to day (Breevaart and Bakker, 2018). Further, perceptions of transformational leadership by subordinates have been demonstrated as flexible and responsive to training, indicating that these perceptions might in fact fluctuate on a daily level depending upon contextual factors (Barling, Weber, & Kelloway, 1996). Daily transformational leadership specifically has demonstrated positive relationships with followers' daily work engagement and daily stress levels. For example, Breevaart and colleagues (2014) conducted a daily diary study of transformational leadership within a population of naval cadets and found that daily perceptions of transformational leadership significantly contributed to increases in followers' daily level of work engagement. A within person approach to studying transformational leadership at the daily level allows for the examination of leadership in a natural context, mitigates potential for recall bias, and provides a more proximal look at follower outcomes (Breevaart et al., 2014). In addition, cross-sectional versus longitudinal studies have demonstrated differential relationships between transformational leadership and sleep quality (Munir & Nielsen, 2009). Diary studies that investigate daily fluctuations of workplace resources contribute significantly to the understanding of the psychological processes under study (Tims, Bakker, & Xanthopoulou, 2011). Further, examining transformational leadership at the daily level will allow for the exploration of the more immediately demanding nature that some of the facets of transformational leadership can pose for followers.

#### 1.1.4.1 Intellectual Stimulation and Inspirational Motivation as Leader Demands

On the daily level, two facets of transformational leadership (intellectual stimulation and inspirational motivation) ought to function like demands on followers. Both intellectual stimulation and inspirational motivation are facets of transformational leadership that promote challenge and growth. Intellectual stimulation challenges followers in creative problem solving and innovative thinking. Inspirational motivation sets clear, future-oriented goals and communicates expectations revolving around achieving these goals (Bass, 1985). These two facets may put forth the opportunity for learning and growth while simultaneously inducing strain (Cavanaugh, Boswell, Roehling, & Boudreau, 2000). Given that these facets necessitate effort, but yield potential benefits, they align with the theoretical construct of challenge stressors. Challenge stressors are defined as job demands that create challenge and/or present the opportunity for future employee growth and development and have been associated with both positive (e.g., job satisfaction) and negative (e.g., exhaustion) outcomes (LePine, Podsakoff, & LePine, 2005; LePine, LePine, & Jackson, 2004). Furthermore, Rodell and Judge (2009) examined daily job demands and found that challenge stressors (i.e., workload, time urgency, job responsibility, and job complexity) are associated with counterproductive work behaviors through anxiety.

Under JD-R, experiencing daily demands will result in a depletion of resources. For example, in a daily diary study among a population of teachers, days that teachers were exposed to more job demands resulted in higher levels of daily exhaustion and increased reports of health problems (Simbula, 2010). Leadership that acts as a work demand is psychologically and physiologically burdensome, and work demands make it difficult for individuals to relax and stay relaxed in order to sleep (Åkerstedt, 2006). Intellectual stimulation and inspirational motivation provide challenges and opportunities for growth



for followers, but these challenges can also create strain and short-term health impairment under the JD-R Theory. For example, in a study examining goal-focused leadership and personality's impact on follower exhaustion, individuals high in neuroticism and low in conscientiousness experienced heightened levels of exhaustion when goal-focused leadership was high (Perry, Witt, Penney, & Atwater, 2010). Further, in a study of 214 employees across various industries that investigated the indirect relationship of transformational leadership with follower emotional exhaustion, Stein and colleagues (2020) found that transformational leader behaviors that encouraged extra effort were linked to heightened levels of emotional exhaustion among employees with psychological detachment. When individuals attempt to reach a goal that they feel is unattainable, they experience emotional distress (Wrosch, Scheier, Carver, & Schulz, 2003). Though leader intellectual stimulation and inspirational motivation may longitudinally contribute to the development of an employee, in the short-term, these challenging, growth-oriented behaviors are likely to act as demands and thus result in the experience of strain in the form of depletion of energy levels and health. Thus, I hypothesize:

*H1a-b: Leader demands (intellectual stimulation and inspirational motivation) will exhibit negative relationships with (a)sleep quality and (b)sleep quantity.*

#### 1.1.4.2 Idealized Influence and Individualized Consideration as Leader Support

On the daily level, two facets of transformational leadership (idealized influence and individualized consideration) ought to function like resources for followers. These facets relate to leaders that act as role models and recognize individual, specific needs of employees (Bass, 1985). Both the idealized influence and individualized consideration

facets of transformational leadership give consideration to followers' unique abilities, needs, and goals (Bass, 1985). These two facets of transformational leadership also capture leadership behaviors that create a supportive environment. Under JD-R, resources, such as supportive leadership, act to facilitate employees' work goal achievement, and also reduce job demands and associated costs. Supervisor support acts to mitigate job demands and their associated energy costs, and instead facilitates better sleep quality and quantity for employees. This facilitation of better sleep bolsters employee resources, allowing workers to better pursue goal achievement.

There is clear empirical evidence linking daily support to follower wellbeing. For example, in Simbula's (2010) daily diary study of teachers, daily support from co-workers acted as a job resource in promoting work engagement, and further these resources were indirectly related to both daily job satisfaction and mental health. Bakker (2015) used JD-R to posit that employees with job resources (i.e., social support, autonomy) are motivated to use their job resources in order to stay engaged with tasks and work toward performance goals. Further, in a study investigating job resources and positive health outcomes, a positive relationship was found between job resources (i.e., supportive leadership, job control, interpersonal fairness) and work engagement, job satisfaction, affective commitment, and job-related enthusiasm, while the presence of job resources was negatively related to negative health outcomes (i.e., exhaustion, insomnia, and psychosomatic disorders) (Brauchli, Jenny, Füllemann, & Bauer, 2015).

Looking specifically at daily supportive leadership behaviors, Sianoja et al. (2020) studied sleep leadership and family-supportive supervisor behaviors (FSSB) as a predictor of sleep quality and quantity, and found a significant relationship between ratings of

supervisor-rated FSSB and improved sleep hygiene as well as reduced sleep impairment among followers. These supportive supervisor behaviors may be generalizable to overall supportive supervisor behaviors put forth in transformational leadership theory—suggesting that supportive transformational leader behaviors may have a profound, positive impact on sleep outcomes; consequently, these facets of transformational leadership should create job resources and increases in motivation and energy levels under JD-R theory. Thus, I hypothesize:

*H2a-b: Leader support (individualized consideration and idealized influence) will exhibit positive relationships with (a)sleep quality and (b)sleep quantity.*

#### *1.1.5 Fatigue and Sleep Hygiene Behaviors as Mediators*

JD-R suggests that demands and resources have negative and positive relationships, respectively, with health outcomes, including sleep (Jacobs, 2019). The relationship between leader demands and resources on follower sleep outcomes remains unclear. Evidence points toward two key mediators: fatigue and sleep hygiene behaviors.

Under JD-R, when demands are high and resources are depleted, energy is decreased (Bakker, 2011). Fatigue is “the awareness of a decreased capacity for physical and/or mental activity due to an imbalance in the availability, utilization, and or restoration of resources needed to perform activity,” (Aaronson et al., 1999, p. 46). Fatigue has associations with chronic illness long-term and has also demonstrated outcomes that affect every day wellbeing (Aaronson et al., 1999). Additionally, fatigue has significant negative correlations with sleep duration and sleep efficiency, and significant positive correlations with sleep-related tension and distress (Alapin, Fichien, Creti, Bailes, & Wright, 2000).

Demanding leadership likely results in increased follower fatigue, and this fatigue further impacts followers' behaviors, such as sleep hygiene behaviors, as a result of depleted energy levels and resources.

One key behavioral predictor of sleep quality and quantity that deserves further exploration is sleep hygiene behavior. Daily sleep hygiene behaviors are actions that contribute to or hinder an individual from getting better sleep, such as engaging in activities close to bedtime, using the bed for activities other than sleep, or sleeping in an uncomfortable sleeping environment. Hamilton and colleagues (2020) conducted a study that examined both motivational and volitional processes that might predict college students' sleep hygiene behaviors, and found significant direct effects of attitude, perceived behavioral control, past behavior, and subjective norms on student intention to perform sleep hygiene behaviors, as well as a significant direct effect of action planning on performance of sleep hygiene behaviors.

Action planning, which demonstrated a direct, positive relationship with sleep hygiene behaviors, is an effortful process (Hamilton, Ng, Zhang, Phipps, Zhang, 2020). Sleep hygiene behaviors have been found to be self-regulatory, meaning that effective sleep hygiene habits require effort to perform each day (Kor & Mullan, 2011). Fatigue will reduce levels of energy and sleep hygiene behaviors, which are effortful, self-regulatory behaviors. This reduction of energy levels will result in reduced performance of action planning or self-regulatory behaviors—specifically the sleep hygiene behaviors that will be investigated in this study. Both physical fatigue and psychological fatigue can be viewed as a responses to internal or external demands exceeding available resources and ultimately result in a lack of motivation and an awareness of the decrease of ability to perform mental

or physical activities (Aaronson et al., 1999). This decrease in ability to perform activities could manifest itself in reduced performance of proper sleep hygiene habits; when fatigue is high, energy and motivation are low, likely resulting in a reduced willingness to participate in healthy sleep hygiene behaviors and instead promoting mindless activity (e.g., watching tv before bed) due to the mental and physical degradation that result from fatigue (Techera, Hallowell, Stambaugh, Littlejohn, 2016).

Ultimately, under the JD-R theory, I argue that daily leader behaviors ought to influence follower sleep through their influence on fatigue and sleep hygiene behaviors. Job demands and job resources can take the form of many different workplace characteristics, including leader behaviors toward subordinates (Jacobs, 2019). These daily behaviors acting as demands and resources can impact follower energy and health, resulting in potential increases or decreases in fatigue levels and subsequent performance of sleep hygiene behaviors. Demands posed by leaders are burdensome to followers, thus increasing their fatigue; alternately, resources increase energy, thereby reducing follower fatigue. Because of these relationships, demanding transformational leadership facets ought to increase fatigue and supportive transformational leadership facets ought to reduce it. Sleep hygiene behaviors explain *how* leader behaviors impact followers' subjective sleep outcomes. Because fatigue likely leads to reduced sleep hygiene, sleep outcomes including sleep quality and quantity will be negatively impacted after a follower is subjected to transformational leadership demands and positively impacted after a follower experiences supportive transformational leadership. Together, these relationships likely explain how the facets of transformational leadership impact sleep on a daily level. Thus, I hypothesize:

*H3a-b: Leader demands (intellectual stimulation and inspirational motivation) will exhibit negative serial indirect within-person relationships with (a)sleep quality and (b)sleep quantity via increased fatigue and consequently decreased sleep hygiene behaviors.*

*H4a-b: Leader support (individualized consideration and idealized influence) will exhibit positive serial indirect within-person relationships with (a)sleep quality and (b)sleep quantity via decreased fatigue and consequently increased sleep hygiene behaviors.*

#### *1.1.6 Personality and its Link to Health and Sleep Outcomes*

Little attention has been given to the links between personality, sleep, and real-world outcomes (Gray & Watson, 2002). This study aims to fill this gap in research and clarify for whom leadership behaviors are related to sleep outcomes. JD-R Theory is rooted in the idea that job demands and job resources are *perceived* by followers and subsequently responded to (Bakker & Demerouti, 2007). JD-R highlights the contribution of personality within its theoretical framework as one of the primary individual differences that affects how individuals interpret or perceive job demands and/or resources (Bakker, Boyd, Dollard, Gillepsie, Winefield, Stough, 2010). This can exaggerate or mitigate the relationship between these perceived variables and employee outcomes. Further, under transactional stress models (Lazarus & Folkman, 1984), individuals with certain dispositions may appraise more stimuli as stressors and perceive these stressors as more stressful, thus exacerbating their own symptomatology (Eberhart & Hammen, 2010).

One key personality trait that may impact the perceptions of job demands, in particular, is neuroticism. Highly neurotic individuals are typically characterized as being more emotional, anxious, depressed, or lonely (McCrae & Costa, 1997). They tend to

respond poorly to stressors and have stronger reactions evoked from stressors as compared to their less neurotic counterparts (Thompson, 2008). Even upon exposure to the same stressors, neurotic individuals tend to demonstrate higher negative reactivity and higher perception of distress as compared to their less neurotic counterparts (Bolger & Schilling, 1991).

Personality, in particular, neuroticism, lends itself well into the proposed model of this study with prior demonstrated links to wellbeing outcomes, such as sleep. Within the context of the workplace, leader demands can be perceived as more distressing by, and evoke stronger reactions from, highly neurotic individuals as compared to their less neurotic counterparts, even if the leadership demands posed are the same. These leader demands and reduced resources under JD-R would therefore lead to lack of energy. A heightened reaction to job demands could result in negative outcomes for neurotic individuals, including reduction in sleep quality and quantity. For example, Gray and Watson (2002) found that although low extraversion, low conscientiousness, and high neuroticism predicted subjective sleep quality, neuroticism had the strongest relationship with subjective sleep quality. This is likely because individuals high in neuroticism are typically expected to have difficulty regulating their emotions and their behavior. In fact, affective and personality features typical of highly neurotic individuals, including anxiety, are risk factors for the ultimate development of insomnia (Singareddy, Vgontzas, Fernandez-Mendoza, Liao, Calhoun, Shaffer, & Bixler, 2012). Križan and Hisler (2019) found significant relationships between neuroticism and variability in sleep duration, variability in sleep continuity, and variability in subjective sleep quality; they also found relationships between neuroticism and decreased sleep continuity and average subjective

sleep quality. It has been demonstrated that both low conscientiousness and high neuroticism are the best personality predictors of poor sleep hygiene habits, low sleep quality, and increased sleepiness overall (Duggan, Friedman, McDevitt, & Mednick, 2014).

These studies failed to explore neuroticism's potential moderating effect on daily fatigue, which ultimately may impact sleep hygiene behaviors and sleep quality and quantity. Previous studies, such as that conducted by De Hoogh and Den Hartog (2009) have demonstrated that neuroticism plays a moderating role in the relationship between leader behaviors and follower health outcomes; their study demonstrated that the influence of autocratic leadership on burnout was positive for highly neurotic individuals, but weakened for less neurotic employees. In addition, because neurotic individuals respond more reactively to stressors, it is important to consider that stressors, including leadership demands, may change from day to day (Thompson, 2008). Because of its demonstrated positive links to high reactivity to demands, lack of behavioral or affective control, and fatigue and emotional exhaustion, neuroticism likely impacts the strength of the relationships between leader demands and follower fatigue. These daily fluctuations may evoke more or less of a negative response depending upon depletion of followers' daily resources.

Job demands result in loss of resources and can result in energy losses. Neuroticism has shown a significant, positive relationship with fatigue after controlling for health indices (Vassend, Røysamb, Nielsen, & Czajkowski, 2018). Further, state level neuroticism has shown a positive relationship with emotional exhaustion (Sosnowska, Fruyt, & Hofmans, 2019). Under JD-R Theory, demanding stressors lead to the depletion



of energy resources, and because of neuroticism's demonstrated relationship with heightened levels of fatigue, it is likely that neuroticism will moderate the effect of leader demands on follower fatigue. Thus, I hypothesize:

*H5: The relationship between leader demands (in the form of intellectual stimulation and inspirational motivation) and follower fatigue, and ultimately sleep hygiene behaviors and sleep outcomes, will be stronger for individuals with higher levels of neuroticism.*

#### *1.1.7 The Present Study*

The primary purpose of the present study is to test a model linking different facets of transformational leadership with sleep outcomes through the lens of JD-R via serial mediation with fatigue and sleep hygiene behaviors. This study also investigates the role of neuroticism in strengthening the relationship between leader demands and follower fatigue. This study contributes to previously identified gaps in the literature because it examines the subdimensions of transformational leadership distinctly in order to ascertain their potential differential effects on follower sleep outcomes, including sleep hygiene behaviors and sleep quality and quantity. In addition, this study delves further into previous research by examining the relationship of transformational leadership on sleep outcomes on the daily level by utilizing experiential sampling methodology in order to collect longitudinal data that is nested within individuals.

## CHAPTER 2. METHOD

### 2.1 Participants

Participants in this study were employed, full-time working (30 hours+, per IRS guidelines) adults, aged 21 and older (this stipulation was due to the study being part of a larger study in which alcohol and tobacco consumption were measured). Participants working nightshift work were excluded from this study because they tend to exhibit different, often shortened sleep duration as compared to populations that work more standard hours (Luckhaupt & Calvert, 2010).

Participants were recruited via community flyers and social networks. This method of sampling was used to attract individuals from a variety of occupations and job conditions, rather than one organization. Participants were sampled from the Atlanta and Metro-Atlanta area (which is the 9<sup>th</sup> most populous city in the U.S.) (U.S. Census Bureau, 2021).

The initial sample of 139 full time workers underwent initial ID data cleaning in order to ensure that each ID was correctly matched and entered for each participant across all surveys. All daily responses were screened to ensure that no participant had multiple responses per any one time point. If a participant logged multiple responses per time point, the most complete or, in the case of two equally complete responses, the first logged response was used for final analysis. Participants that did not complete any daily surveys beyond the initial baseline survey ( $n = 7$ ) and participants that failed any of the attention checks in the initial baseline summary ( $n = 5$ ) were excluded from analyses. A level-2

sample size of at least 50, but preferably at least 100 is necessary to accurately estimate parameters (Maas & Hox, 2005). Thus, the final sample size of 127 participants was satisfactory to conduct analyses and estimate parameters.

This study was comprised of 127 participants (52.8% women, 46.3% men, 0.8% trans male/trans man; 77.0% heterosexual, 9.0% gay, 13.9% bisexual) aged 21 to 63 ( $M = 30.38$ ,  $SD = 9.58$ ). Participants described their ethnic background as 61.3% White, 21.8% Black, 4.0% American Indian, 13.7% Asian, 2.4% other race, 8.9% Hispanic/Latino). At the time of initial data collection, 67.7% of participants were working primarily remotely. On average, participants had worked in their current position at the time of data collection for 2.39 years ( $SD = 3.50$ ) and with their supervisor for slightly less time ( $M = 1.66$ ,  $SD = 2.46$ ). In the event that an individual did not interact with their leader by any communication means on a given work day, the outcome measures for that day were not included in analyses. Of the total 853 after work surveys that participants completed, 393 (46.1%) indicated that a participant did not interact with their supervisor via any communication form that work day.

## **2.2 Measures**

### *2.2.1 Demographics*

Sex, gender identity, race, ethnicity, age, income, and nature of work (remote versus in-person) (Appendix A) were collected in the initial baseline measurement survey.

### *2.2.2 Attention Checks*

Throughout the baseline measurement survey, four attention checks (e.g., “Please choose strongly agree.”) were utilized in order to ensure thoughtful responses. Attention

checks have been demonstrated as key in identifying careless respondents in incentivized studies (Shamom & Berning, 2020).

### 2.2.3 *Neuroticism*

Johnson's (2014) IPIP-NEO-120 (Appendix B) was administered to each participant in order to measure participants' personality—specifically, the construct of neuroticism was of interest ( $M = 2.63$ ,  $SD = .63$ ,  $\alpha = .90$ ) (IPIP-NEO-120, Johnson, 2014).

When using the Big Five, an individual's personality tends to be relatively steady across time, particularly day to day because the Big Five measures traits, not states (Leon, Gillum, Gillum, & Gouze, 1979). McRae and Costa (1997) put forth the accepted notion that personality traits are stable patterns of thoughts, emotions, and behaviors that comprise an individual's typical functioning. Therefore, the IPIP-NEO-120 was administered once at baseline for each participant. There are twenty-four items in this measure that examine individual trait-level neuroticism. Items are indicative of an individual's level of neuroticism, or lack of emotional stability. An example of a neuroticism item is "I get angry easily." Participants rated their agreement with the item as it describes them on a 5-point Likert scale ranging from "1- Very Inaccurate" to "5 - Very Accurate."

### 2.2.4 *Transformational Leadership*

Daily transformational leadership was measured using a transformational leadership measure adapted from the MLQ 5x (Bass & Avolio, 1995). This five-item scale was adapted to the daily level (Appendix C) (Breevaart et al., 2014). Because the scale consisted of only five items, a factor analysis allowing each item onto one of the subfactors

of transformational leadership could not be conducted, as there must be more than one item per factor (Tabachnick and Fidell, 2007). The five items were sorted by two independent raters into one of the two factors: demanding transformational leadership behaviors or supportive transformational leadership behaviors. The two raters were members of the research team and subject matter experts in the area of transformational leadership. In order to sort these behaviors into categories, descriptions were provided for each. Demanding transformational leadership behaviors were to be those that largely promoted challenge and growth, such as aligns with intellectual stimulation and inspirational motivation (Bass, 1985). On the other hand, supportive transformational leadership behaviors were to be those that largely gave consideration to followers' unique abilities, needs, and goals and created a supportive environment, such as aligns with individualized consideration and idealized influence (Bass, 1985). After independently sorting these five-items, researchers conferred and did not have any discrepancies.

The demanding transformational leadership items were: "Today, my leader got me to look at problems from different angles." and "Today, my leader helped me to develop my strengths." The other three items from the five-item scale were used to examine daily supportive transformational leadership behaviors. These support items were: "Today, my leader talked enthusiastically about what needed to be accomplished.", "Today, my leader emphasized the importance of having a collective sense of mission.", and "Today, my leader expressed confidence that goals would be achieved."

#### 2.2.5 *Fatigue*

Fatigue was evaluated using an adapted version of the Three Dimensional Work Fatigue Inventory (3D-WFI) (Frone & Tidwell, 2015) (Appendix D), with a Cronbach's  $\alpha = .93$ . This nine-item measure examines participants' mental, physical, and emotional fatigue and has been adapted in order to reflect daily levels of fatigue. This measure was aggregated across the three dimensions of fatigue in order to obtain a general measure of participants' daily fatigue. This scale has been adapted in previous research to measure fatigue at the daily level (Scheibe & Moghimi, 2019). This scale was set on a 5-point Likert scale with "1" being "Totally Disagree" and "5" being "Totally Agree", with a sample item including, "Today I felt physically drained at the end of the workday."

#### 2.2.6 *Sleep Hygiene*

Sleep hygiene was measured using the Sleep Hygiene Index (Mastin, Bryson, & Corwyn, 2006) ( $\alpha = .48$ ) (Appendix E), which was adjusted to ask questions on the daily level. This formative scale measure includes thirteen total items and is answered either "Yes" or "No" with regard to sleep hygiene behaviors from the night before. These behaviors were assessed at the daily level, the morning following the night of sleep, along with sleep quality and quantity. Previous studies have also adapted this measure to the daily level (Knufinke, Nieuwenhuys, Geurts, Møst, Moen, Maase, Coenen, Gordijn, & Kompier, 2020). A sample item includes, "I did important work before bedtime last night (for example: pay bills, schedule, or study)."

#### 2.2.7 *Sleep Quality and Quantity*

Measurement of subjective sleep quality and quantity were measured using the Sleep Quantity and Quality: Consensus Sleep Diary, (Carney, Buysse, Ancoli-Israel,

Edinger, Krystal, Lichstein, & Morin, 2012) (Appendix F). This measure was subject to validation with focus groups and lexical analysis by Carney and colleagues (2012) and demonstrated strong support for its validity. Sleep diaries are widely used in clinical and research settings, and provide insights into sleeping and waking behaviors in a digestible manner (Monk, Reynolds, Kupfer, Buysse, Coble, Hayes, Machen, Petrie, & Ritenour, 1994). Sleep diaries are considered the “gold standard” of subjective sleep assessment (Carney et al., 2012, p. 287). This measure includes eight total items and asks participants to report number and length of awakenings, deviation from their typical sleep schedule (i.e., getting into bed earlier than normal, sleeping later than normal), sleep onset latency, sleep efficiency, and perceived sleep quality. Sleep quantity is then calculated as time in minutes from time reported falling asleep to final awakening, minus the number of minutes awake during mid-night awakenings. Sleep quality was measured with one item (“How would you rate the quality of your sleep on a scale from 1-10?”).

### **2.3 Procedure**

This study is a part of a larger work and health field study. Participants were brought into the lab and administered informed consent. Each participant received a unique Participant ID that they entered at the beginning of each survey. This ID was the first two letters of their middle name (those without middle names will use “AA”), the first two letters of their mother’s maiden name, and their birth month and day written numerically (e.g., ELSI1013). This kept participant data anonymous but traceable across all time points. Participants were then administered a baseline survey via Qualtrics. This survey measured neuroticism using a subscale from the IPIP-NEO-120 (Johnson, 2014). After administration of the neuroticism measure, subjects were thoroughly trained in response

procedures/expectations involving survey responses for perceived leader behaviors, and sleep surveys (Appendix G). Participants received a survey at the beginning of their day (available from approximately 5:00 am to 10:00 am) via a smartphone app asking them to respond to measures of their sleep quantity and quality, as well as their sleep hygiene behaviors for the previous night. After work each day (available from approximately 3:00 pm to 8:00 pm), participants received a survey asking them to respond to measures of their leader's behaviors that day. Before bed (available from approximately 8:00 pm to 1:00 am), participants received a survey prompting them to respond to a measure of their fatigue levels (3D-WFI, Frone & Tidwell, 2015). Participants submitted responses to these surveys daily. This pattern of sampling continued for the following nine work days, for a total of ten days. Both Ohly and colleagues (2010) and Fisher and To (2012) suggest finding a balance between collecting enough data from each participant with continued participant compliance. Both include two-week periods of data collection as a satisfactory sampling period. Further, given that this study is not explicitly designed to capture change in health behaviors over time, a ten-workday period of data collection should allow for enough variability at the individual level while minimizing the likelihood of participant attrition. To fairly compensate participants for their time, those who completed the study without any missing data received \$100 each. Each participant received \$15 for attending the baseline survey meeting that takes place in the lab at Georgia Tech, and subsequently received \$2.50 for each completed daily survey. If a participant completed all 30 surveys without missing a time point, they were awarded a \$10 bonus, for the potential total to earn up to \$100 sent via mailed check from Georgia Tech. Participants were not compensated



for any missed surveys and were not able to go back and fill them out after the time window passed.

## CHAPTER 3. RESULTS

The results of this study are presented in six sections. I begin by outlining the preliminary analyses that were conducted in order to assess the assumptions for normality within the data set. Then, I discuss the process of factor analysis on the transformational leadership measure used in this study in order to test the assertion that daily transformational leadership behaviors may be differentially perceived by followers. Next, I justify the use of multilevel modeling for the data prior to testing the hypotheses. Then, I present analyses that were used to test the hypotheses of this study. Finally, I conclude by running a series of supplementary analyses that examine alternative models to that which was hypothesized.

### 3.1 Preliminary Analyses

The data for the final sample of 127 participants, consisting of 1220 observations, was assessed for normality and the presence of outliers using skewness and kurtosis values and Q-Q plots for each variable of interest (Aguinis, Gottfredson, & Joo, 2013; Appendix H). A total of 44 potential error outliers were identified from sleep quantity reports. These outliers lay distinctly outside of (either above or below) 97.5% of data. These potential error outliers were first examined for inaccurate reporting, and 3 of these were removed from analysis, as they were resultant of inaccuracies (i.e., lying outside the possible range of values).

The remaining 41 potential error outliers in sleep quantity values were removed from the model when analyzing model fit. Per Aguinis et al. (2013), because model fit, homogeneity of variance, and linearity improved as a result of the removal of these outliers,

and given examination of these outliers did not prove to suggest meaningful variance, but rather inaccuracy of reporting, results that are presented in the Hypothesis and Model Testing section of this paper are those with the outliers removed from the data set.

Linearity was assessed visually using scatterplots. Homogeneity of variance was examined using box and whisker plots for participants on each outcome measured (Appendix I). Issues with this assumption would present themselves if the plots were not similar in size and overlapped for each outcome. Because analysis in this study assumes homoscedasticity, this was further evaluated by visually assessing scatterplots of predicted values against residuals (Appendix J). Upon removal of error outliers within sleep quantity data, linearity and homogeneity of variance assumptions were satisfactorily met.

### **3.2 Factor Analysis**

A Multilevel Confirmatory Factor Analysis (MCFA) was run, with supportive items loading onto one factor, and demanding items loading onto a second factor; this was done using daily data so that level-1 was within person and level-2 was between person and fully saturated. The results of this model and factor loadings can be found in Table 1 and Table 2, respectively. In a test of model fit, it was found that the chi-squared goodness of fit test was not statistically significant ( $\chi^2(4) = 9.39, p = .052$ ), thus indicating that this model does not fit the data significantly worse than when variables are all allowed to correlate with one another (i.e., the difference between the sample and fitted covariance matrices). Further, the Comparative Fit Index (CFI), the Tucker Lewis Index (TLI), the root mean squared error of approximation (RMSEA), and the standardized root mean squared residual (SRMR) for this hypothesized, two-factor model indicate acceptable fit

(CFI = .996; TLI = .990; RMSEA = .054; SRMR = .013). According to Hu and Bentler (1999), good rules of thumb for minimizing both Type I and Type II errors are cutoff values of CFI>.96, TLI>.96, RMSEA<.05, and SRMR<.06. Most of the rules of thumb are satisfied or almost satisfied. A test of a one-factor model was also run. The chi-squared goodness of fit test was statistically significant ( $\chi^2(5) = 46.60, p < .001$ ). Further, the CFI, the TLI, the RMSEA, and SRMR for this one-factor model did not indicate as acceptable fit as the two-factor model (CFI = .969; TLI = .938; RMSEA = .134; SRMR = .031). To compare fit of the one-factor and two-factor models of transformational leadership, I examined the difference in chi-squared test and the result was significant ( $\Delta\chi^2(1) = 37.21, p < .05$ ). Therefore, the one-factor model of transformational leadership fit the data significantly worse than the two-factor model. Overall, the results of these factor analyses and goodness of fit tests support the treatment of transformational leadership as two factors differentially predicting outcomes in the hypothesized model.

**Table 1 Results of MCFA**

	$\chi^2$	<i>df</i>	CFI	RMSEA	SRMR
Single Factor	<b>46.60<sup>***</sup></b>	5	.97	.13	.03
Two Factor	9.393	4	1.0	.05	.01

Note: Significant effects are presented in boldface. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

**Table 2 Unstandardized Factor Loadings (Standard Errors) for Two-Factor Confirmatory Model.**

Item	Demanding Transformational Leadership	Supportive Transformational Leadership
	Unstandardized	Unstandardized
Talked enthusiastically about what needed to be accomplished.		1.00 (--)
Emphasized the importance of having a collective sense of mission.		1.15 (.06)
Expressed confidence that goals would be achieved.		.97 (.05)
Got me to look at problems from different angles.	1.00 (--)	
Helped me to develop my strengths.	1.14 (.06)	

Note: Unstandardized factor loadings. () indicates standard error for loadings, dashes (--) indicate standard error was not estimated.

### 3.3 Justification of Multilevel Modeling

Because measures were repeated among individuals across multiple days and data from each day was nested within individuals, multilevel modeling was required. In order to further justify the use of multilevel modeling, the null multilevel model for the outcome variables (i.e., sleep quantity and sleep quality) was regressed on 1, and the intraclass correlation was calculated by taking the variance of the intercept and dividing that by the

sum of the variance of the intercept and the residual variance. The intraclass correlation is indicative of the variance in the outcome variable that can be accounted for by the clustering created at level-2. In this study, measures at the daily level were clustered within participant, and therefore the ICCs for the outcome variables are indicative of the total variance that can be accounted for by within-person level clustering. All variables had an ICC between .33 and .51, suggesting meaningful variance at both the daily and the individual levels, thereby justifying the use of multilevel modeling (Bliese, 1998).

A multilevel correlation matrix of the variables of interest can be found below (Table 3).

**Table 3 Multilevel correlation matrix and descriptive statistics of study variables**

	<i>M<sub>bw</sub></i>	<i>SD<sub>bw</sub></i>	<i>SD<sub>w</sub></i>	<i>Skewnes</i>	<i>Kurtosis</i>	<i>ICC</i>	1	2	3	4	5	6	7	8	9
	<i>S</i>														
1.Demanding Trans. Leadership	3.11	0.85	0.67	-.37	-.46	.46	(.83)	<b>.82***</b>	-.01	<b>.26*</b>	.14	.02	-.15	.01	.13
2. Supportive Trans. Leadership	3.37	0.81	0.59	-.55	.00	.51	<b>.63***</b>	(.85)	-.01	<b>.31**</b>	.05	.14	-.16	.06	.12
3. Fatigue	2.35	0.79	0.57	.53	-.25	.51	-.11	-.12	(.93)	<b>-.34***</b>	<b>-.24*</b>	.03	<b>.34***</b>	.08	.15
4. Sleep Hygiene	1.78	0.12	0.10	-.38	-.22	.46	<b>-.10*</b>	<b>-.06**</b>	-.06	(.46)	.18	<b>.23*</b>	-.17	-.08	<b>-.24*</b>

5. Sleep Quality	6.74	1.50	1.31	-.54	.24	.40	.01	-.02	-.04	.25	--	.23	<b>-.45***</b>	-.01	-.04
6. Sleep Quantity	435.9	46.28	53.86	-.27	.20	.33	.15	.09	.02	<b>.19*</b>	.32	--	.00	-.05	.12
7. Neuroticism	2.62	0.63		.29	-.59								<i>(.90)</i>	-.10	.14
8. Age	30.38	9.58												--	.03
9. Sex	1.53	0.50													--

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Note: Between subjects correlations are presented above the diagonal, within subjects correlations are presented below the diagonal. Cronbach's alphas are presented in italics along the diagonal. Statistically significant correlations are presented in boldface. Trans. = Transformational. Sex is coded 1 = man, 2 = woman. ICC = intra-class correlation, \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . Correlations were calculated with pairwise deletion;  $N_{between} = 95-124$ ;  $N_{within} = 457-592$ .



### 3.4 Hypothesis and Model Testing

In order to test the paths in the hypothesized model, multilevel path analysis was used. This model was run with the second level fully saturated, as the relationships of interest are the within-person, daily effects at level-1. Multilevel modeling was performed using Mplus (version 8.7; Muthén & Muthén, 1998–2021) with the Bayes estimator. The Bayes estimator for this study used non-informative priors to form posterior distributions for parameter estimates, thereby adding meaningful constraints before estimating. One of the many advantages of using the Bayes estimator compared to the traditional full information maximum likelihood estimator is that it can provide more accurate results when parameters are non-normally distributed and skewed (Muthén, 2010; van de Schoot et al., 2013; Zyphur & Oswald, 2013). Further, the Bayes estimator is considered more flexible and less arduous computationally compared to traditional ML (Muthén, 2010; Zyphur & Oswald, 2013). The Bayes estimator in Mplus reports the 95% confidence interval for proposed pathways in models, and can be interpreted as a 95% probability that the true population value lies in the interval (van de Schoot et al., 2013). If the confidence interval does not include zero, the parameter is interpreted as being statistically significant.

#### 3.4.1 Hypothesis 1

Hypothesis 1 (H1a-b) posited that leader demands (intellectual stimulation and inspirational motivation) would exhibit negative relationships with (a) sleep quality and (b) sleep quantity. In order to test this hypothesis and hypothesis 2, a model was run with leader demands and leader support directly predicting sleep quantity and sleep quality. Demanding transformational leadership did not demonstrate a significant relationship with

either sleep quantity ( $\gamma = 10.25$ ,  $SD = 8.79$ ,  $p = .26$ ,  $CI_{95\%} = [-8.66, 25.94]$ ) or sleep quality ( $\gamma = 0.01$ ,  $SD = 0.15$ ,  $p = .98$ ,  $CI_{95\%} = [-0.30, 0.30]$ ). Thus, Hypothesis 1 was not supported.

### 3.4.2 Hypothesis 2

Hypothesis 2 (H2a-b) posited that leader support would exhibit positive relationships with (a) sleep quality and (b) sleep quantity. Supportive transformational leadership did not demonstrate a significant relationship with either sleep quantity ( $\gamma = 0.95$ ,  $SD = 11.45$ ,  $p = .93$ ,  $CI_{95\%} = [-17.96, 25.35]$ ) or sleep quality ( $\gamma = -0.04$ ,  $SD = .17$ ,  $p = .84$ ,  $CI_{95\%} = [-0.36, 0.28]$ ). Thus, Hypothesis 2 was not supported. Results of hypothesis testing for both Hypothesis 1a-b and Hypothesis 2a-b can be found in Table 4 below.

**Table 4 Multilevel path analysis results (Model 1)**

Predictor	Model 1	
	Sleep Quality	Sleep Quantity
Demanding Transformational Leadership	.01 (.15)	10.25 (8.79)
Supportive Transformational Leadership	-.04 (.17)	.95 (11.45)
$\sigma^2$	2.10 (.14)	3838.0 (272.77)

Note: For Model 1,  $N_{between} = 117$ ,  $N_{within} = 865$ . Effects are unstandardized. Posterior standard deviations of the effect estimate are presented in italics and parentheses. Participants who were missing data on all exogenous variables were not included in analysis. Significant effects are presented in boldface. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

### 3.4.3 Hypotheses 3 and 4

In order to test Hypotheses 3 and 4, a model with daily supportive and daily demanding transformational leadership behaviors predicting daily follower sleep quality and quantity through fatigue and then sleep hygiene behaviors was run. The results from this model can be found in Table 5.

**Table 5 Multilevel path analysis results (Model 2)**

Predictor	Model 2			
	Fatigue	Sleep Hygiene	Sleep Quality	Sleep Quantity
Demanding Transformational Leadership	-.03 (.05)			
Supportive Transformational Leadership	-.90 (.06)			
Fatigue		-.01 (.01)		
Sleep Hygiene			<b>3.51 (.61) *</b>	<b>111.19 (26.44) ***</b>
$\sigma^2$	.43 (.04)	.01 (.00)	2.00 (.13)	3889.10 (249.21)

Note: For Model 2,  $N_{between} = 117$ ,  $N_{within} = 865$ . Effects are unstandardized. Posterior standard deviations of the effect estimate are presented in italics and parentheses. Participants who were missing data on all exogenous variables were not included in analysis. Significant effects are presented in boldface. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Hypothesis 3 (H3a-b) posited that leader demands would exhibit negative serial indirect within-person relationships with (a) sleep quality and (b) sleep quantity via increased fatigue and consequently decreased sleep hygiene behaviors. Demanding transformational leadership did not demonstrate a significant relationship with fatigue ( $\gamma = -0.03$ ,  $SD = 0.05$ ,  $p = .61$ ,  $CI_{95\%} = [-0.13, 0.07]$ ). Further, fatigue did not demonstrate a significant relationship to sleep hygiene behaviors ( $\gamma = -0.01$ ,  $SD = 0.01$ ,  $p = .41$ ,  $CI_{95\%} = [-0.04, 0.02]$ ). Moreover, the indirect effect of demanding transformational leadership on sleep quality via fatigue and then sleep hygiene was not significant (effect = 0.00,  $SD = 0.01$ ,  $p = .62$ ,  $CI_{95\%} = [-0.02, 0.01]$ ). In addition, the indirect effect of demanding transformational leadership on sleep quantity via fatigue and then sleep hygiene was not significant (effect = -0.16,  $SD = 0.60$ ,  $p = .62$ ,  $CI_{95\%} = [-1.73, 0.58]$ ). Taken together, these results suggest that Hypothesis 3 was not supported.

Hypothesis 4 (H4a-b), in turn, suggested that leader support would exhibit positive serial indirect within-person relationships with (a) sleep quality and (b) sleep quantity via decreased fatigue and consequently increased sleep hygiene behaviors. Supportive transformational leadership did not demonstrate a significant relationship with fatigue ( $\gamma = -0.07$ ,  $SD = 0.07$ ,  $p = .61$ ,  $CI_{95\%} = [-0.19, 0.10]$ ). Further, fatigue did not demonstrate a significant relationship to sleep hygiene behaviors ( $\gamma = -0.01$ ,  $SD = 0.01$ ,  $p = .38$ ,  $CI_{95\%} = [-0.04, 0.01]$ ). Moreover, the indirect effect of supportive transformational leadership on sleep quality via fatigue and then sleep hygiene was not significant (effect = 0.00,  $SD = 0.01$ ,  $p = .62$ ,  $CI_{95\%} = [-0.01, 0.02]$ ). In addition, the indirect effect of supportive

transformational leadership on sleep quantity via fatigue and then sleep hygiene was not significant (effect = 0.04,  $SD = 0.18$ ,  $p = .62$ ,  $CI_{95\%} = [-0.21, 0.51]$ ). Taken together, Hypothesis 4 was also not supported.

#### 3.4.4 Hypotheses 5

Hypothesis 5 suggested that the relationship between leader demands and follower fatigue, and ultimately sleep hygiene behaviors and sleep outcomes would be stronger for individuals with higher levels of neuroticism. In order to test this hypothesis, the full model with both mediators and neuroticism as a moderator was run. As summarized in Table 6 (below), neuroticism did not predict variance in the relationship between demanding transformational leadership and fatigue ( $\gamma = -0.13$ ,  $SD = 0.08$ ,  $p = .12$ ,  $CI_{95\%} = [-0.26, 0.03]$ ), as the confidence interval includes zero. Thus, Hypothesis 5 was not supported.

**Table 6 Multilevel path analysis results (Model 3)**

Predictor	Model 3			
	Fatigue	Sleep Hygiene	Sleep Quality	Sleep Quantity
Demanding Transformational Leadership				
Supportive Transformational Leadership	-.07 (.07)			
Fatigue		-.01 (.01)		
Sleep Hygiene			<b>3.50 (.62) ***</b>	<b>108.24 (27.22) ***</b>
Neuroticism x Demanding TL	-.13 (.08)			
$\tau_{00}$	.09 (.04)			
$\sigma^2$		.01 (.00)	2.00 (.13)	3889.07 (249.21)

Note: For Model 3,  $N_{between} = 113$ ,  $N_{within} = 837$ . Effects are unstandardized. Posterior standard deviations of the effect estimate are presented in italics and parentheses. Participants who were missing data on all exogenous variables were not included in analysis. Significant effects are presented in boldface. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

### 3.5 Supplementary Model Testing

Age and gender have been demonstrated to impact sleep (e.g., Basner, Fomberstein, Razavi, Banks, William, Rosa, & Dinges, 2007; Hale & Do, 2007; Grandner, Patel, Gehrman, Xie, Sha, Weaver, & Nalaka, 2010). Because of these demonstrated relationships, I explored these variables as control variables and added each of the variables

to the hypothesized model in order to test for improved model fit. In addition, to account for potential sleep spillover from night to night, the hypothesized moderated serial mediation model was run with a correction using lagged auto-regression for sleep. This model controlled for variations in sleep that can result from sleep spill-over in order to isolate follower sleep at the daily level while controlling for previous night's sleep. Results from the test of this model can be seen below in Table 7.

**Table 7 Multilevel path analysis results (Model 4)**

Predictor	Model 4			
	Fatigue	Sleep Hygiene	Sleep Quality	Sleep Quantity
Demanding Transformational Leadership	.03 (.26)			
Supportive Transformational Leadership	-.06 (.07)			
Fatigue		-.02 (.01)		
Sleep Hygiene			<b>3.23 (.56) ***</b>	<b>102.10 (24.68) ***</b>
Neuroticism x Demanding TL	-.04 (.10)			
Sleep Quality T-1			-.07 (.06)	
Sleep Quantity T-1				-.08 (.06)
Age			.00 (.01)	-.30 (.38)
Gender			.02 (.17)	2.22 (8.57)
$\tau_{00}$	.13 (.05)			
$\sigma^2$		.01 (.00)	1.87 (.11)	3601.57 (217.65)

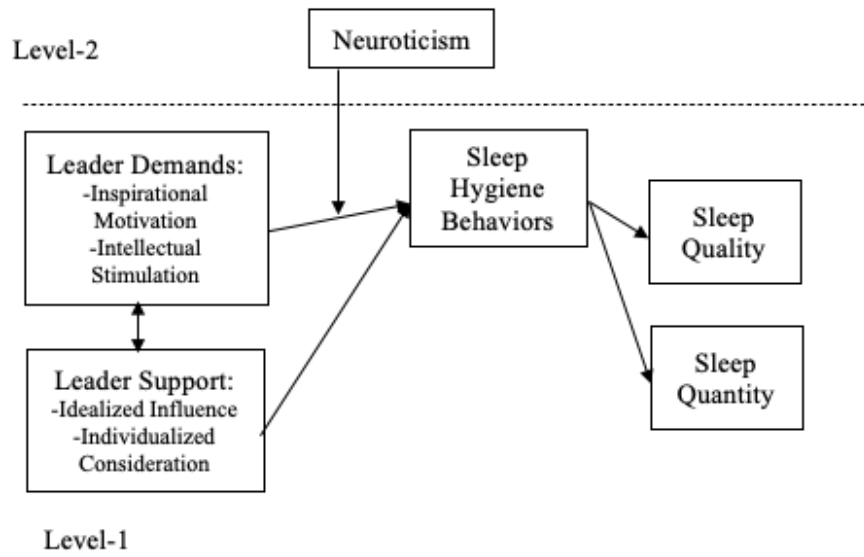
Note: For Model 4,  $N_{between} = 127$ ,  $N_{within} = 1169$ . Controlling on Age, Sex, Income, and Auto-Regression of Sleep (Sleep Quality T-1, Sleep Quantity T-1). Effects are unstandardized. Posterior standard deviations of the effect estimate are presented in italics and parentheses. Participants who were missing data on all exogenous variables were not included in analysis. Significant effects are presented in boldface.

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$



With the inclusion of control variables and the lagged auto-regression for previous day's sleep, the relationship between demanding transformational leadership and fatigue was not significant ( $\gamma = 0.03$ ,  $SD = 0.26$ ,  $p = .90$ ,  $CI_{95\%} = [-0.43, 0.59]$ ). Further, the path from demanding transformational leadership to sleep hygiene behaviors was not significantly moderated by neuroticism ( $\gamma = -0.04$ ,  $SD = 0.10$ ,  $p = .60$ ,  $CI_{95\%} = [-0.25, 0.12]$ ). The relationship between supportive transformational leadership behaviors and fatigue was also not significant ( $\gamma = -0.06$ ,  $SD = 0.07$ ,  $p = .46$ ,  $CI_{95\%} = [-0.18, 0.09]$ ). The relationship between sleep hygiene behaviors and sleep quantity ( $\gamma = 102.10$ ,  $SD = 24.68$ ,  $p < .01$ ,  $CI_{95\%} = [55.86, 159.30]$ ) and sleep quality ( $\gamma = 3.23$ ,  $SD = 0.56$ ,  $p < .01$ ,  $CI_{95\%} = [2.14, 4.32]$ ) remained significant.

To further investigate potential relationships among study variables, supplementary model analyses were conducted. The first additional model (Figure 2) removes fatigue as a potential mediator after the previous model demonstrated nonsignificant paths from both transformational leadership subdimensions to fatigue. This supplementary model still gives consideration to sleep hygiene behaviors as a potential mediator after significant relationships were found from sleep hygiene behaviors to both sleep outcomes. The results of this model can be found in Table 8.



**Figure 2 Supplementary moderated mediation model with days nested within persons**

**Table 8 Multilevel path analysis results (Model 5)**

Predictor	Model 5		
	Sleep Hygiene	Sleep Quality	Sleep Quantity
Demanding Transformational Leadership	-.06 (.06)		
Supportive Transformational Leadership	-.01 (.02)		
Sleep Hygiene		<b>3.53 (.60) ***</b>	<b>113.07 (26.80) ***</b>
Neuroticism x Demanding TL	.02 (.02)		
$\tau_{00}$	-.07 (.06)		
$\sigma^2$		1.99 (.13)	3863.61 (248.43)

Note: For Model 5,  $N_{between} = 113$ ,  $N_{within} = 837$ . Effects are unstandardized. Posterior standard deviations of the effect estimate are presented in italics an parentheses. Participants who were missing data on all exogenous variables were not included in analysis. Significant effects are presented in boldface. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Within this alternative model, the path from demanding transformational leadership behaviors to sleep hygiene behaviors is again not significant ( $\gamma = -0.06$ ,  $SD = 0.06$ ,  $p = .38$ ,  $CI_{95\%} = [-0.17, 0.05]$ ). Further, the path from demanding transformational leadership to sleep hygiene behaviors does not appear to be significantly moderated by neuroticism ( $\gamma = 0.02$ ,  $SD = 0.02$ ,  $p = .54$ ,  $CI_{95\%} = [-0.03, 0.06]$ ). The path from supportive transformational leadership to sleep hygiene behaviors is again not significant ( $\gamma = -0.01$ ,

$SD = 0.02, p = .74, CI_{95\%} = [-0.04, 0.02]$ ). Sleep hygiene is again significantly related to sleep quality ( $\gamma = 3.53, SD = 0.60, p < .001, CI_{95\%} = [2.34, 4.71]$ ) and sleep quantity ( $\gamma = 113.07, SD = 26.80, p < .001, CI_{95\%} = [59.71, 165.36]$ ). Thus, despite exploration of a more parsimonious model, none of the full, proposed paths in the model were significant.

Lastly, a model test of the alternative, more parsimonious model that excludes fatigue as a mediator was run with control variables (i.e., age and gender) and a correction for negative lagged auto-regression of sleep. The results of this model (Model 6) can be found in Table 9.

**Table 9 Multilevel path analysis results (Model 6)**

Predictor	Model 6		
	Sleep Hygiene	Sleep Quality	Sleep Quantity
Demanding Transformational Leadership	-.05 (.06)		
Supportive Transformational Leadership	.00 (.01)		
Sleep Hygiene		<b>3.25 (.59) ***</b>	<b>102.50 (25.31) ***</b>
Neuroticism x Demanding TL	.01 (.02)		
Sleep Quality T-1		-.07 (.05)	
Sleep Quantity T-1			-.07 (.06)
Age		.00 (.01)	-.02 (.34)
Gender		.04 (.21)	2.53 (10.58)
$\tau_{00}$	.00 (.00)		
$\sigma^2$		1.87 (.12)	3606.04 (224.59)

Note: For Model 6,  $N_{between} = 127$ ,  $N_{within} = 1169$ . Controlling on Age, Sex, Income, and Auto-Regression of Sleep. Effects are unstandardized. Posterior standard deviations of the effect estimate are presented in italics an parentheses. Participants who were missing data on all exogenous variables were not included in analysis. Significant effects are presented in boldface. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

The relationship between demanding transformational leadership and sleep hygiene behaviors was not significant ( $\gamma = -0.05$ ,  $SD = 0.06$ ,  $p = .30$ ,  $CI_{95\%} = [-0.16, 0.05]$ ). Neuroticism did not significantly moderate the relationship between demanding transformational leadership and sleep hygiene behaviors ( $\gamma = 0.01$ ,  $SD = 0.02$ ,  $p = .58$ ,  $CI_{95\%} = -0.03, 0.06$ ). The relationship between supportive transformational leadership and sleep hygiene behaviors was not significant ( $\gamma = 0.00$ ,  $p = .89$ ,  $SD = 0.01$ ,  $CI_{95\%} = [-0.03, 0.03]$ ). As before, the relationships between sleep hygiene behaviors and sleep quality ( $\gamma = 3.25$ ,  $SD = 0.59$ ,  $p < .01$ ,  $CI_{95\%} = [2.09, 4.43]$ ) and sleep quantity ( $\gamma = 102.50$ ,  $SD = 25.31$ ,  $p < .01$ ,  $CI_{95\%} = [51.35, 151.57]$ ) were significant. Thus, transformational leadership behaviors do not appear to have a partially mediated impact on follower sleep outcomes even after accounting for control variables and negative auto-regression of sleep from the previous day.

## CHAPTER 4. DISCUSSION

The purpose of this study was to investigate the potential, differential effects of two aspects of transformational leadership on follower sleep outcomes at the daily level using experience sampling methods and multilevel, moderated serial mediation. Although the relationships between leadership and sleep outcomes have been thoroughly established, there is a missing link as to *why* these relationships exist (Munir & Nielsen, 2009). Specifically, this study intended to examine *how* and *for whom* leadership behaviors impact sleep outcomes. This study drew upon Job-Demands Resources Theory (Bakker & Demerouti, 2007) with the aim to elucidate the missing link between leadership support and demands and subsequent follower sleep outcomes in the workplace via fatigue and sleep hygiene behaviors, and further investigate how neuroticism may have altered these relationships. Although hypotheses were largely unsupported, there were two key significant findings from this study.

First, factor analysis supported a two-factor model of the five-item, daily transformational leadership measure used in this study, such that behaviors that were most aligned with promoting challenge and growth loaded onto a demanding transformational leadership factor, and behaviors that most aligned with giving consideration to followers' unique abilities, needs, and goals and also created a supportive environment loaded onto a supportive transformational leadership factor. Ultimately, this supported the two-factor structure of transformational leadership and allowed for deeper exploration of potential, differential relationships from these predictors to mediating mechanisms and then outcomes.

Second, in line with established findings, a significant, positive relationship between follower sleep hygiene behaviors and both sleep quantity and sleep quality was supported. Thus, increased practice of sleep hygiene behaviors can improve both sleep quality and quantity, even at the daily level.

#### **4.1 Theoretical Implications**

The current understanding of *how* work characteristics, including leader behaviors, influence follower health behaviors and outcomes, is not well established. The proposed model explored a more nuanced exploration of mediating and moderating relationships, unique triggers of sleep behaviors and outcomes, and work characteristics as predictors of follower sleep behaviors. Further, the proposed model examined these relationships at the daily level. The day-to-day fluctuations in leadership and the impacts these fluctuations may have on follower outcomes are meaningful, yet have remained largely unexplored up to this point.

This study's most prominent contribution to theory is in its expansion of transformational leadership theory (Bass, 1985); it does so by considering the potential, differential impacts of the facets of transformational leadership at the daily level. Two factors of daily transformational leadership—supportive and demanding—were supported using factor analysis and subsequently investigated. Though these subsequent investigations did not support the hypothesized relationships, this approach to studying transformational leadership behaviors uses a novel lens to explore possible differences in perceptions of, and responses to, transformational leadership behaviors. It also answers the call made by Avolio, Bass, and Jung (1999) for research that does not rely on a single



measure of transformational leadership, but rather considers distinct components of transformational leadership in order to investigate possible differential relationships. This novel perspective attempted to challenge the common assumption that transformational leadership evokes exclusively positive outcomes for followers, as tends to be the primary focus of studies around transformational leadership and follower outcomes (Dumdum, Lowe, & Avolio, 2002).

This study also contributed to the understanding of JD-R in that not all job demands (i.e., demanding transformational leadership) are necessarily linked to reported loss of energy after work or immediate health impairment via negative sleep outcomes. Further, not all job resources (i.e., supportive transformational leadership) are necessarily linked to energy gains after work. This study illuminates important temporal considerations around when resource loss or gain may occur as a result of job demands and when subsequent consequences of these may impact an individual. It does so by establishing narrow time frames around measurement of leadership behaviors and subsequent follower behaviors and outcomes (as opposed to averages across two-week periods, which is commonly seen in this research), so that these relationships might be examined through a more granular lens.

JD-R further highlights the contribution of personality within its theoretical framework as one of the primary individual differences that affects how individuals interpret or perceive job demands and/or resources (Bakker, Boyd, Dollard, Gillespie, Winefield, Stough, 2010). This can exaggerate or mitigate the relationship between these perceived variables and employee outcomes. Further, under transactional stress models (Lazarus & Folkman, 1984), individuals with certain dispositions may appraise more

stimuli as stressors and perceive these stressors as more stressful, thus exacerbating their own symptomatology (Eberhart & Hammen, 2010). This study addresses the call to give attention to the links between personality, sleep, and real-world outcomes by Gray and Watson (2002). It does so by examining the (ultimately unsupported) moderating effect of neuroticism on the relationship from demanding transformational leadership to mediating mechanisms.

Lastly, this study explores temporal considerations around Job-Demands Resources Theory (Bakker & Demerouti, 2007) by testing a time frame through which the energy depletion or bolstering might occur. Though the model was not significant, this study addresses Bakker, Demerouti, and Sanz-Vergel's (2014) call for research on outcomes of job demands and job resources on the daily and momentary level. Despite previous research arguing that the function of transformational leader can shift from day to day, and research suggesting that daily transformational leadership behaviors are linked to daily follower outcomes (Barling et al., 1996; Breevaart et al., 2014) the results of this study point toward potential boundary conditions, in that these fluctuations may not impact more distal follower outcomes, such as follower sleep (Breevaart and Bakker, 2018; Breevaart et al., 2014). This daily investigation furthers the field by giving narrow temporal consideration to processes examined in the study. Rather than aggregate, average level measures, it examines processes at the daily level, within person. This is done to better ascertain when energy resource changes may occur as a result of daily transformational leadership behaviors. Further, this study also allows for a daily exploration of how these daily interactions might (or might not) indirectly present themselves in sleep outcomes.

## **4.2 Practical Implications**

The findings of this study hold relevance for researchers, managers, and subordinates. This study demonstrated that transformational leadership is made up of two domains, one that is largely supportive, and one that tends to be more demanding on followers. It is important that leaders understand that, though enacting transformational leadership behaviors still results in positive, long-term work outcomes, some of these behaviors may cause short-term resource depletion or may be interpreted in the short-term as demanding. Knowing this is critical in ensuring a leader strikes a balance in the transformational leadership behaviors exhibited. Overall, it may still be important that a leader engage in both domains of transformational leadership behavior in order to provide both support and healthy challenge.

Though sleep as a health outcome tends to be increasingly emphasized within organizations to promote follower health and well-being, this study reinforces the importance of emphasizing sleep hygiene behaviors to provide employees with actionable ways in which they might work toward better sleep. Regardless of variables added or taken away from the model, this study demonstrated strong, positive relationships between performance of sleep hygiene behaviors and both sleep quality and sleep quantity. Increased education and emphasis on sleep hygiene behaviors may prove to be beneficial in both the short-term and long-term for organizations, as sleep-related outcomes act as important contributors to outcomes such as job attitudes and organizational commitment (Litwiller et al., 2017).

### **4.3 Limitations and Future Directions**

The present study was not without limitations. Because of the COVID-19 pandemic, many participants were performing primarily remote work that were not before the pandemic struck. Participants that were once performing in-person work were subject to different levels of exposure to their leader than before their work environment shifted. In fact, of all completed after-work surveys, 54.9% included data on leader interactions at work that day. Therefore, only about half of all after-work surveys had data that was used in analyses of model fit. This lack of leader interaction collected in the study may limit conclusions that can be drawn in that simply interacting with your leader or not may be predictive of outcomes of other variables in the study. Though this is beyond the scope of this study, future work exploring these relationships should be considered. Followers were also likely exposed to their leader less than they were pre-pandemic, and therefore effects of leadership may have been lessened in this study. In addition, the prevalence of remote work might have resulted in the varied salience or richness of leader's transformational leadership behaviors and followers' perceptions of these behaviors. Participants in the study worked fully remote, fully in-person, or somewhere in between the two, and these different modalities from day-to-day within person, and between-participants may have influenced outcomes. For example, individuals that irregularly interacted in-person with their supervisor and at other times virtually with their supervisor may have felt different levels of fatigue due to the modality of leadership behaviors they experienced, rather than the behaviors themselves. Again, though further examination is beyond the scope of this study and the propositions initially made, future work exploring these relationships should be considered. Further, due to anxiety and stress related to the pandemic, leadership's

impacts may not have been as felt due to the sharp increase in COVID anxiety and decrease in work engagement (Andel, Arvan, and Shen, 2021).

The COVID-19 pandemic likely had differential impacts on factors that impact sleep that may not have previously been an issue prior to the pandemic, such as heightened anxiety levels, decreased work and family boundaries, and elimination of commute time considerations for final wake up time. A recent investigation of the impact of COVID-19 on depression, anxiety, and stress found a significant decrease of sleep for adults during the outset of the pandemic (Stanton et al., 2020). It may be the case that perhaps when external factors are impeding heavily on stress and health outcomes, relationships between daily leader interactions and follower outcomes may no longer be significant. Further, participants in the study worked in differing modalities, and thus may have had different perceptions of leader behaviors depending on whether their interactions were virtual or in-person that day, or the days prior (i.e., hybrid work). Future research might better test for differential relationships between supervisor interactions, mediating mechanisms, and ultimate sleep outcomes as a result of modality by using populations of primarily-remote and primarily-in-person workers. This would allow for the isolation of these relationships such that they might be compared.

In the future, researchers interested in the differential impacts of transformational leadership at the daily level may consider using a measure of transformational leadership with items that are intentionally formed to load onto two factors--supportive and demanding. In addition to this, transformational leadership itself may be too broad of a leadership measure to explore with relation to such specific follower outcomes. In fact, other, more domain-specific forms of leadership within the field of health leadership, such

as sleep leadership might better lend to these specific follower outcomes. Sleep leadership behaviors are those that aim to encourage and enable healthy sleep in followers, and interventions with leaders encouraging these behaviors have demonstrated improvements in employee sleep outcomes (Adler et al., 2021; Sianoja et al., 2020). This study highlights that more broad forms of leadership may not be the best way to impact follower sleep outcomes through supervisor behavior. Perhaps these more specific, health-oriented leadership behaviors may deserve more focus in organizations.

Despite this study's use of daily measures of behaviors, mediators, and outcomes, there may perhaps be even more nuance to the temporal nature of these relationships. Perhaps it is the case that these relationships exist within a smaller window of time, where fatigue is more immediate and short-lasting after a demanding transformational leadership behavior is experienced. Or it could be the case these relationships take longer to build over time, and in fact are best measured every few days or weeks, rather than at the daily level. McEwen and Stellar's (1993) concept of allostatic load, for example, refers to the body's ability to maintain homeostasis through stressors and the ultimate overload that may result in exhaustion after repeated, accumulated exposure to stressors. Future research might consider allostatic load and explore the timeline by which work demands, namely demanding transformational leadership, impact health behaviors and health outcomes.

As an alternate consideration to fatigue for mediating mechanisms in this study, future research may instead consider different, more emotionally-charged mediating mechanisms than fatigue, that may better capture the relationship from leadership behavior to ultimate sleep outcomes, such as state anxiety or rumination. Another mediating mechanism that would serve to gauge follower engagement may be time spent working

that day. Perhaps followers with exposure to many demanding transformational leadership behaviors in a day subsequently work more hours in a given day to meet high demands, and subsequently sleep less. Lastly, a mediating mechanism around *intentionality* to partake in sleep hygiene behaviors in a given day may better pinpoint sleep outcomes as opposed to actual performance of these behaviors. This may work around the issue of impeding home circumstances that prohibit the performance of sleep hygiene behaviors, such as a noisy sleeping environment due to a sick child. If the intention was to perform sleep hygiene behaviors in order to get more sleep or better quality sleep, perhaps this is an outcome of supportive or demanding transformational leadership behaviors.

#### **4.4 Conclusions**

The purpose of this study was to investigate the potential, differential effects of the facets of transformational leadership on follower sleep outcomes at the daily level using experience sampling methodology and multilevel, moderated serial mediation. Largely, these relationships were not supported. However, two components of transformational leadership—supportive and demanding transformational leadership—were supported using factor analysis and subsequently investigated. In line with established findings, a significant, positive relationship between follower sleep hygiene behaviors and both sleep quantity and sleep quality was supported. Moving forward, research might better explore the potential relationships in the modern working world between supervisor interactions, mediating mechanisms, and ultimate sleep outcomes by using populations of primarily-remote and primarily-in-person workers. Furthermore, future explorations in this area of research might investigate the timeframe during which relationships between leader

behavior and follower health outcomes unfold—perhaps one even more narrow than that investigated in this study.



## APPENDIX A. DEMOGRAPHIC SURVEY

What sex were you assigned at birth, such as on an original birth certificate?

- Male
- Female

How do you describe yourself?

- Male
- Female
- Trans Male/Trans Man
- Trans Female/Trans Woman
- Gender Queer/Gender Nonconforming
- Different Identity

Do you consider yourself to be:

- Heterosexual or straight
- Gay
- Lesbian
- Bisexual
- Not listed above (please specify):
- Prefer not to answer

Race

- White
- Black or African American
- American Indian or Alaska Native
- Asian
- Native Hawaiian or Pacific Islander
- Other

#### Ethnicity

- Hispanic or Latino or Spanish Origin
- Not Hispanic or Latino or Spanish Origin

Age: \_\_\_\_\_

Job Title: \_\_\_\_\_

#### Occupation

- Agriculture, Food & Natural Resources
- Architecture & Construction
- Arts, Audio/Visual Technology & Communications
- Business Management & Administration
- Education & Training
- Finance
- Government & Public Administration
- Health Science
- Hospitality & Tourism

- Human Services
- Information Technology
- Law, Public Safety, Corrections & Security
- Manufacturing
- Marketing
- Science, Technology, Engineering & Mathematics
- Transportation, Distribution & Logistics

#### Salary

- \$0 - \$24,999
- \$25,000 - \$49,999
- \$50,000 - \$74,999
- \$75,000 - \$99,999
- \$100,000 - \$149,999
- \$150,000 or more

How long have you been working your current position?

Years: \_\_\_\_\_ Months: \_\_\_\_\_

Q170

How long have you had your current supervisor at work as your supervisor?

Years: \_\_\_\_\_ Months: \_\_\_\_\_

Are you primarily working remotely or in-person at this time?

- Primarily remote work
- Primarily in-person work

## APPENDIX B. NEO-120

The following pages contain phrases describing people's behaviors. Please use the rating scale next to each phrase to describe how accurately each statement describes you. Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age. So that you can describe yourself in an honest manner, your responses will be kept in absolute confidence. Please read each statement carefully, and then click the circle that corresponds to the accuracy of the statement.

Please read each item carefully and choose the one answer that best corresponds to your agreement or disagreement. **If you think the statement is very inaccurate pick 1, if it is moderately inaccurate pick 2, if it is neither accurate nor inaccurate pick 3, if it is moderately accurate pick 4, and if it is very accurate pick 5.**

	Very Inaccurate - 1	Moderately Inaccurate - 2	Neither Accurate nor Inaccurate - 3	Moderately Accurate - 4	Very Accurate - 5
Worry about things.					
Make friends easily.					

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Have a vivid imagination.	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	1	2	3	4	5
	neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	1	2	3	4	5
Trust others.	neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	1	2	3	4	5





	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Love large parties.	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
See beauty in things that others might not notice.	- 1	- 2	- 3	4	5
	Inaccurate				
	rate -				
	4				
	- 3				
	Moderately				
	Neither				
	Accurate				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	- 1	- 2	- 3	4	5
	Inaccurate				
	rate -				
	4				
	- 3				

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Use flattery to get ahead.	- 3				
	- 1				
	- 2				
	- 3				
	4				
	5				
	rate				
	rate -				
	rate -				
	rate -				
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	- 1				
	- 2				
	- 3				
	4				
	5				

[illegible]

	Neither				
	Accurate				
	Very	Moderately	neither	Moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	- 1	- 2	- 3	4	5
	urate	urate	ate	Accu	rate -
	- 1	- 2	nor	rate -	5
			Inacc	4	
			urate		
			- 3		
Take charge.					
	Very	Moderately	Neither	Moderately	Very
	Inacc	Inacc	Accur	y	Accu
	urate	urate	ate	Accu	rate -
	- 1	- 2	nor	rate -	5
			Inacc	4	

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Experience my emotions intensely.	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
	urate				
	- 3				
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5

	<p>Neither</p> <p>Accurate</p> <p>Moderately</p> <p>Very</p> <p>Inaccurate</p> <p>1</p>				
	Very	Moderately	Neither	Moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	1	2	3	4	5
Make people feel welcome.	<p>Neither</p> <p>Accurate</p> <p>Moderately</p> <p>Very</p> <p>Inaccurate</p> <p>1</p>				
	Very	Moderately	Neither	Moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	1	2	3	4	5
Keep my promises.	<p>Neither</p> <p>Accurate</p> <p>Moderately</p> <p>Very</p> <p>Inaccurate</p> <p>1</p>				
	Very	Moderately	Neither	Moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	1	2	3	4	5





			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
	urate	urate	ate	Accu	rate -
	- 1	- 2	nor	rate -	5
			Inacc	4	
			urate		
			- 3		
Am always busy.					
			Neither	Moderatel	
	Very	Moderately	Accur	y	Very
	Inacc	Inacc	ate	Accu	Accu
	urate	urate	nor	rate -	rate -
	- 1	- 2	Inacc	4	5



			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
Love a good fight.					
			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
Work hard.					
	Very	Moderately	Neither	Moderatel	Very
	Inacc	Inacc	Accur	y	Accu

			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
	urate	urate	ate	Accu	rate -
	- 1	- 2	nor	rate -	5
			Inacc	4	
			urate		
			- 3		
Often eat too much.					
			Neither	Moderatel	
	Very	Moderately	Accur	y	Very
	Inacc	Inacc	ate	Accu	Accu
	urate	urate	nor	rate -	rate -
	- 1	- 2	Inacc	4	5

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Love excitement.	urate				
	- 3				
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	urate				
	rate -				
	rate -				
	- 1	- 2	- 3	4	5

[illegible]

	Very Inaccurate - 1	Moderately Inaccurate - 2	Neither Accurate nor Inaccurate - 3	Moderately Accurate - 4	Very Accurate - 5
Believe that I am better than others.					
Start tasks right away.					





[illegible]

	Neither				
	Accurate				
	Very	Moderately	neither	Moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	- 1	- 2	- 3	4	5
Tend to vote for liberal political candidates.	Inaccurate				
	rate - 4				
	- 3				
	Moderately				
	Very	Moderately	Neither	Moderately	Very
	Inaccurate	Inaccurate	Accurate	Accurate	Accurate
	urate	urate	ate	rate -	rate -
	- 1	- 2	nor	4	5
	Inaccurate				

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Sympathize with the homeless.	- 3				
	- 1				
	- 2				
	- 3				
	4				
	5				

[illegible]

			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
Warm up quickly to					
others.					
			Neither	Moderatel	
	Very	Moderately	Accur	y	Very
	Inacc	Inacc	ate	Accu	Accu

			Neither		
			Accurate	Moderately	
	Very	Moderately	neither	Accurate	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	1	2	3	4	5
	urate	urate	neither	rate -	rate -
	- 1	- 2	Inaccurate	4	5
			urate		
			- 3		
Enjoy wild flights of fantasy.					
			Neither	Moderately	
	Very	Moderately	Accurate	Accurate	Very
	Inaccurate	Inaccurate	neither	Accurate	Accurate
	urate	urate	neither	rate -	rate -
	- 1	- 2	Inaccurate	4	5

	Very Inaccurate - 1	Moderately Inaccurate - 2	Neither Accurate nor Inaccurate - 3	Moderately Accurate - 4	Very Accurate - 5
Believe that others have good intentions.					



	<div> <div>Neither</div> <div>Accurate</div> <div>Moderately</div> <div>Very</div> </div> <div> <div>Very</div> <div>Moderately</div> <div>Inaccurate</div> <div>- 1</div> </div> <div> <div>nor</div> <div>Inaccurate</div> <div>- 3</div> </div> <div> <div>y</div> <div>Accurate</div> <div>4</div> </div> <div> <div>Very</div> <div>Accurate</div> <div>5</div> </div>				
Excel in what I do.	<div> <div>Neither</div> <div>Accurate</div> <div>Moderately</div> <div>Very</div> </div> <div> <div>Very</div> <div>Moderately</div> <div>Inaccurate</div> <div>- 1</div> </div> <div> <div>nor</div> <div>Inaccurate</div> <div>- 3</div> </div> <div> <div>y</div> <div>Accurate</div> <div>4</div> </div> <div> <div>Very</div> <div>Accurate</div> <div>5</div> </div>				
Get irritated easily.	<div> <div>Neither</div> <div>Accurate</div> <div>Moderately</div> <div>Very</div> </div> <div> <div>Very</div> <div>Moderately</div> <div>Inaccurate</div> <div>- 1</div> </div> <div> <div>Neither</div> <div>Accurate</div> </div> <div> <div>Moderately</div> <div>y</div> </div> <div> <div>Very</div> <div>Accurate</div> </div>				

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	rate				
	- 1				
	- 2				
	- 3				
	4				
	5				
	rate				
	- 1				
	- 2				
	neither				
	Inaccurate				
	4				
	rate				
	- 3				
Talk to a lot of different people at parties.	Neither				
	Accurate				
	Moderately				
	Very	Moderately	ate	y	Very
	Inacc	Inacc	nor	Accu	Accu

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Do not like art.	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
	urate	urate	Inaccurate	rate -	rate -
	- 1	- 2	urate	4	5
			- 3		
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5

			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5

Know how to get  
around the  
rules.

			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5

Like to tidy up.

[illegible]



	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Seldom get emotional.	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
	Neither				
	Accurate				
Love to help others.	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5

[illegible]



	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	- 1	- 2	- 3	4	5
	Inaccurate				
	rate - 4				
	- 3				
Am easily intimidated.	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	- 1	- 2	- 3	4	5

	<div> <div>Neither</div> <div>Accurate</div> <div>Moderately</div> <div>Very</div> </div> <div> <div>Very</div> <div>Moderately</div> <div>Inaccurate</div> <div>Inaccurate</div> <div>- 1</div> </div> <div> <div>neither</div> <div>Accurate</div> <div>neither</div> <div>Inaccurate</div> <div>- 3</div> </div> <div> <div>neither</div> <div>Accurate</div> <div>neither</div> <div>Inaccurate</div> <div>- 3</div> </div> <div> <div>neither</div> <div>Accurate</div> <div>neither</div> <div>Inaccurate</div> <div>- 3</div> </div> <div> <div>neither</div> <div>Accurate</div> <div>neither</div> <div>Inaccurate</div> <div>- 3</div> </div>				
Am always on the go.	<div> <div>Neither</div> <div>Accurate</div> <div>Moderately</div> <div>Very</div> </div> <div> <div>Very</div> <div>Moderately</div> <div>Inaccurate</div> <div>Inaccurate</div> <div>- 1</div> </div> <div> <div>neither</div> <div>Accurate</div> <div>neither</div> <div>Inaccurate</div> <div>- 3</div> </div> <div> <div>neither</div> <div>Accurate</div> <div>neither</div> <div>Inaccurate</div> <div>- 3</div> </div> <div> <div>neither</div> <div>Accurate</div> <div>neither</div> <div>Inaccurate</div> <div>- 3</div> </div> <div> <div>neither</div> <div>Accurate</div> <div>neither</div> <div>Inaccurate</div> <div>- 3</div> </div>				
Dislike changes.	<div> <div>Neither</div> <div>Accurate</div> <div>Moderately</div> <div>Very</div> </div> <div> <div>Very</div> <div>Moderately</div> <div>Inaccurate</div> <div>Inaccurate</div> <div>- 1</div> </div> <div> <div>neither</div> <div>Accurate</div> <div>neither</div> <div>Inaccurate</div> <div>- 3</div> </div> <div> <div>neither</div> <div>Accurate</div> <div>neither</div> <div>Inaccurate</div> <div>- 3</div> </div> <div> <div>neither</div> <div>Accurate</div> <div>neither</div> <div>Inaccurate</div> <div>- 3</div> </div> <div> <div>neither</div> <div>Accurate</div> <div>neither</div> <div>Inaccurate</div> <div>- 3</div> </div>				

[illegible]

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	Very	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Do more than what's expected of me.	- 1	- 2	- 3	4	5
	Inaccurate				
	rate -				
	4				
	- 3				
	Moderately				
	Neither				
	Accurate				
	Very	Moderately	neither	Very	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	- 1	- 2	- 3	4	5

			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
			urate		
			- 3		
Go on binges.			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
Seek adventure.					

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Avoid philosophical discussions.	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	Accurate	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	- 1	- 2	- 3	4	5
Think highly of myself.	Inaccurate	Inaccurate	Accurate	Accurate	Inaccurate
	- 1	- 2	neither	Inaccurate	5
			Inaccurate	4	
			Inaccurate		
			- 3		

			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
			urate		
			- 3		
Find it difficult to			Neither		
get down to			Accur		
work.			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5



	Very Inaccurate - 1	Moderately Inaccurate - 2	Neither Accurate nor Inaccurate - 3	Moderately Accurate 4	Very Accurate 5
Remain calm under pressure.					
Have a lot of fun.					

			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
Believe in one true					
religion.					
			Neither	Moderatel	
	Very	Moderately	Accur	y	Very
	Inacc	Inacc	ate	Accu	Accu

				Neither	
				Accur	
				ate	Moderatel
	Very	Moderately		nor	y
	Inacc	Inacc		Inacc	Accu
	urate	urate		urate	rate -
	- 1	- 2		- 3	4
					5
	urate	urate		nor	rate -
	- 1	- 2		Inacc	4
				urate	5
				- 3	
Feel sympathy for				Neither	
those who are				Accur	
worse off				ate	Moderatel
than myself.	Very	Moderately		nor	y
	Inacc	Inacc		Inacc	Accu
	urate	urate		urate	rate -
	- 1	- 2		- 3	4
					5

	Neither				
	Accurate				
Make rash decisions.	Very	Moderately	neither	Moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	- 1	- 2	- 3	4	5
			urate	rate -	
			- 3	4	
	Neither				
	Accurate				
	Very	Moderately	neither	Moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	- 1	- 2	- 3	4	5
			urate	rate -	
			- 3	4	

	Very Inaccurate - 1	Moderately Inaccurate - 2	Neither Accurate nor Inaccurate - 3	Moderately Accurate - 4	Very Accurate - 5
Am afraid of many things.					
Feel comfortable around people.					

			Neither		
			Accur		
			ate	Moderatel	
Very	Moderately		nor	y	Very
Inacc	Inacc		Inacc	Accu	Accu
urate	urate		urate	rate -	rate -
- 1	- 2		- 3	4	5
			Neither		
			Accur		
			ate	Moderatel	
Very	Moderately		nor	y	Very
Inacc	Inacc		Inacc	Accu	Accu
urate	urate		urate	rate -	rate -
- 1	- 2		- 3	4	5
Love to daydream.					
			Neither		
Very	Moderately				Very
Inacc	Inacc		Accur	Moderatel	Accu
urate	urate		ate	y	rate -
- 1	- 2		nor	Accu	5

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	Very	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
Trust what people say.	Inaccurate				
	rate -				
	4				
	- 3				
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	Very	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5

	Very Inaccurate - 1	Moderately Inaccurate - 2	Neither Accurate nor Inaccurate - 3	Moderately Accurate 4	Very Accurate 5
Handle tasks smoothly.					
Lose my temper.					



[illegible]

			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
	urate	urate	nor	rate -	rate -
	- 1	- 2	Inacc	4	5
			urate		
			- 3		
Do not like poetry.			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5

	<div> <div>Neither</div> <div>Accurate</div> <div>Moderately</div> <div>Very</div> <div>Very</div> </div> <div> <div>Inaccurate</div> <div>Inaccurate</div> <div>Inaccurate</div> <div>Inaccurate</div> <div>Inaccurate</div> </div> <div> <div>- 1</div> <div>- 2</div> <div>- 3</div> <div>4</div> <div>5</div> </div>				
Cheat to get ahead.	<div> <div>Neither</div> <div>Accurate</div> <div>Moderately</div> <div>Very</div> <div>Very</div> </div> <div> <div>Inaccurate</div> <div>Inaccurate</div> <div>Inaccurate</div> <div>Inaccurate</div> <div>Inaccurate</div> </div> <div> <div>- 1</div> <div>- 2</div> <div>- 3</div> <div>4</div> <div>5</div> </div>				
Leave a mess in my room.					

			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
Am often down in					
the dumps.					
			Neither	Moderatel	
	Very	Moderately	Accur	y	Very
	Inacc	Inacc	ate	Accu	Accu

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Take control of things.	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
	urate	urate	neither	rate -	rate -
	- 1	- 2	Inaccurate	4	5
			urate		
	Neither				
	Moderately				
	Accurate				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	urate	urate	neither	rate -	rate -
	- 1	- 2	Inaccurate	4	5
			urate		
			- 3		

	Very Inaccurate - 1	Moderately Inaccurate - 2	Neither Accurate nor Inaccurate - 3	Moderately Accurate - 4	Very Accurate - 5
I am not easily affected by my emotions.					

125

[illegible]



			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
	urate	urate	ate	Accu	rate -
	- 1	- 2	nor	rate -	5
			Inacc	4	
			urate		
			- 3		
Do a lot in my spare					
time.					
			Neither	Moderatel	
	Very	Moderately		y	Very
	Inacc	Inacc	Accur		
	urate	urate	ate	Accu	Accu
	- 1	- 2	nor	rate -	rate -
			Inacc	4	5



	Very Inaccurate - 1	Moderately Inaccurate - 2	Neither Accurate nor Inaccurate - 3	Moderately Accurate 4	Very Accurate 5
Insult people.					
Set high standards for myself and others.					

[illegible]

	Neither				
	Accurate				
	Moderately				
Very	Moderately	neither	moderately	Very	
Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate	
- 1	- 2	- 3	4	5	
	urate	urate	neither	rate -	rate -
	- 1	- 2	Inaccurate	4	5
			urate		
			- 3		
Love action.	Neither				
	Accurate				
	Moderately				
Very	Moderately	neither	moderately	Very	
Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate	
- 1	- 2	- 3	4	5	

	Very Inaccurate - 1	Moderately Inaccurate - 2	Neither Accurate nor Inaccurate - 3	Moderately Accurate - 4	Very Accurate - 5
Have difficulty understanding abstract ideas.					

	<div> <div>Very Inaccurate - 1</div> <div>Moderately Inaccurate - 2</div> <div>Neither Accurate nor Inaccurate - 3</div> <div>Moderately Accurate - 4</div> <div>Very Accurate - 5</div> </div>				
Have a high opinion of myself.					
Need a push to get started.					





	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Love life.					
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate

	<div> <div>Neither</div> <div>Accurate</div> <div>Moderately</div> <div>Very</div> <div>Very</div> </div> <div> <div>Inaccurate</div> <div>Inaccurate</div> <div>Inaccurate</div> <div>Inaccurate</div> <div>Inaccurate</div> </div> <div> <div>- 1</div> <div>- 2</div> <div>- 3</div> <div>4</div> <div>5</div> </div>				
Tend to vote for conservative political candidates.	<div> <div>Neither</div> <div>Accurate</div> <div>Moderately</div> <div>Very</div> <div>Very</div> </div> <div> <div>Inaccurate</div> <div>Inaccurate</div> <div>Inaccurate</div> <div>Inaccurate</div> <div>Inaccurate</div> </div> <div> <div>- 1</div> <div>- 2</div> <div>- 3</div> <div>4</div> <div>5</div> </div>				

	Very Inaccurate - 1	Moderately Inaccurate - 2	Neither Accurate nor Inaccurate - 3	Moderately Accurate - 4	Very Accurate - 5
Suffer from others' sorrows.					
Rush into things.					

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Get stressed out easily.	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate

	Neither				
	Accurate				
	Moderately				
	Very				
	Inaccurate				
	rate -				
	- 1				
	- 2				
	- 3				
	4				
	5				
	rate -				
	rate -				
	- 1				
	- 2				
	Inaccurate				
	4				
	5				
	rate -				
	rate -				
	- 3				
	- 3				
	Moderately				
	Neither				
	Accurate				
	ate				
	Moderately				
	Very				
	Inaccurate				
	rate -				
	- 1				
	- 2				
	- 3				
	4				
	5				
	rate -				
	rate -				
	- 3				
	- 3				
	Moderately				
	Neither				
	Accurate				
	ate				
	Moderately				
	Very				
	Inaccurate				
	rate -				
	- 1				
	- 2				
	- 3				
	4				
	5				
	rate -				
	rate -				
	- 3				
	- 3				

Act comfortably  
with others.

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Like to get lost in thought.	rate -				
	- 1				
	- 2				
	- 3				
	4				
	5				
	rate -				
	- 3				
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	rate -				
	- 1				
	- 2				
	- 3				
	4				
	5				

	Very Inaccurate - 1	Moderately Inaccurate - 2	Neither Accurate nor Inaccurate - 3	Moderately Accurate 4	Very Accurate 5
Know how to get things done.					
Distrust people.					

[illegible]



	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Avoid crowds.					
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate

	Very Inaccurate - 1	Moderately Inaccurate - 2	Neither Accurate nor Inaccurate - 3	Moderately Accurate - 4	Very Accurate - 5
Do not enjoy going to art museums.					
Take advantage of others.					

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Leave my belongings around.	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	Neither				
	Accurate				
	Moderately				
	Very	Moderately	Neither	Moderately	Very
	Inaccurate	Inaccurate	Accurate	moderately	Accurate

	Neither				
	Accurate				
	Moderately				
	Very				
	Inaccurate				
	rate				
	- 1				
	- 2				
	- 3				
	4				
	5				
	rate				
	- 1				
	- 2				
	nor				
	rate -				
	5				
	Inaccurate				
	4				
	rate				
	- 3				
Have a low opinion of myself.	Moderately				
	Neither				
	Accurate				
	rate				
	Inaccurate				
	rate				
	- 1				
	- 2				
	nor				
	rate -				
	4				
	5				
	Inaccurate				

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Wait for others to lead the way.	- 3				
	- 1				
	- 2				
	- 3				
	4				
	5				
	- 3				
	- 1				
	- 2				
	- 3				
	4				
	5				
	- 3				
	- 1				
	- 2				
	- 3				
	4				
	5				
	- 3				
	- 1				
	- 2				
	- 3				
	4				
	5				
	- 3				
	- 1				
	- 2				
	- 3				
	4				
	5				

		<p>Neither</p> <p>Accurate</p> <p>Moderately</p> <p>Very</p> <p>Inaccurate</p> <p>1</p>				
		<p>Neither</p> <p>Accurate</p> <p>Moderately</p> <p>Very</p> <p>Inaccurate</p> <p>2</p>				
		<p>Neither</p> <p>Accurate</p> <p>Moderately</p> <p>Very</p> <p>Inaccurate</p> <p>3</p>				
		<p>Neither</p> <p>Accurate</p> <p>Moderately</p> <p>Very</p> <p>Inaccurate</p> <p>4</p>				
		<p>Neither</p> <p>Accurate</p> <p>Moderately</p> <p>Very</p> <p>Inaccurate</p> <p>5</p>				
Experience very few emotional highs and lows.		<p>Neither</p> <p>Accurate</p> <p>Moderately</p> <p>Very</p> <p>Inaccurate</p> <p>1</p>				
		<p>Neither</p> <p>Accurate</p> <p>Moderately</p> <p>Very</p> <p>Inaccurate</p> <p>2</p>				
		<p>Neither</p> <p>Accurate</p> <p>Moderately</p> <p>Very</p> <p>Inaccurate</p> <p>3</p>				
		<p>Neither</p> <p>Accurate</p> <p>Moderately</p> <p>Very</p> <p>Inaccurate</p> <p>4</p>				
		<p>Neither</p> <p>Accurate</p> <p>Moderately</p> <p>Very</p> <p>Inaccurate</p> <p>5</p>				

	Very Inaccurate - 1	Moderately Inaccurate - 2	Neither Accurate nor Inaccurate - 3	Moderately Accurate - 4	Very Accurate - 5
Turn my back on others.					
Get others to do my duties.					

			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
Am able to stand up					
for myself.					
			Neither	Moderatel	
	Very	Moderately	Accur	y	Very
	Inacc	Inacc	ate	Accu	Accu



	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
Can manage many things at the same time.	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5

[illegible]

[illegible]

			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
Am able to control					
my cravings.					
			Neither	Moderatel	
	Very	Moderately	Accur	y	Very
	Inacc	Inacc	ate	Accu	Accu

	Neither				
	Accurate				
	Very	Moderately	neither	Moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	- 1	- 2	- 3	4	5
	urate	urate	nor	rate -	rate -
	- 1	- 2	Inaccurate	4	5
Enjoy being reckless.	Moderately				
	Neither				
	Very	Moderately	Accurate	y	Very
	Inaccurate	Inaccurate	ate	Accurate	Accurate
	urate	urate	nor	rate -	rate -
	- 1	- 2	Inaccurate	4	5

[illegible]

	Very Inaccurate - 1	Moderately Inaccurate - 2	Neither Accurate nor Inaccurate - 3	Moderately Accurate - 4	Very Accurate - 5
Make myself the center of attention.					
Have difficulty starting tasks.					

			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
			Neither		
			Accur		
			ate	Moderatel	
	Very	Moderately	nor	y	Very
	Inacc	Inacc	Inacc	Accu	Accu
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
Am calm even in					
tense					
situations.					
	Very	Moderately	Neither	Moderatel	Very
	Inacc	Inacc	Accur	y	Accu



	Neither				
	Accurate				
	Very	Moderately	neither	Moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	- 1	- 2	- 3	4	5
	urate	urate	ate	Accu	rate -
	- 1	- 2	nor	rate -	5
			Inacc	4	
			urate		
			- 3		
Laugh aloud.					
	Very	Moderately	Neither	Moderately	Very
	Inacc	Inacc	Accur	y	Accu
	urate	urate	ate	Accu	rate -
	- 1	- 2	nor	rate -	5
			Inacc	4	

	Neither				
	Accurate				
	Moderately				
	Very	Moderately	neither	Very	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
Like to stand during the national anthem.	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
	urate				
	- 3				
	Moderately				
	Neither				
	Accurate				
	Very	Moderately	neither	Very	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	urate	urate	urate	rate -	rate -
	- 1	- 2	- 3	4	5
	Inaccurate				



	Neither				
	Accurate				
	Very	Moderately	neither	Moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	- 1	- 2	- 3	4	5
Act without thinking.	Inaccurate				
	- 3				
	Neither				
	Accurate				
	Very	Moderately	neither	Moderately	Very
	Inaccurate	Inaccurate	Inaccurate	Accurate	Accurate
	- 1	- 2	- 3	4	5

	Very Inaccurate - 1	Moderately Inaccurate - 2	Neither Accurate nor Inaccurate - 3	Moderately Accurate - 4	Very Accurate - 5
Please click moderately inaccurate - 2.					

## APPENDIX C. DAILY TRANSFORMATIONAL LEADERSHIP

Please select your agreement with the following statements on a scale of 1 to 5, with 1 being

"Strongly Disagree" and 5 being "Strongly Agree".

Today, my leader talked enthusiastically about what needed to be accomplished.

3 - Neither Agree

1 - Strongly

nor

5 - Strongly

Disagree

2 - Disagree

Disagree

4 - Agree

Agree

Today, my leader got me to look at problems from different angles.

3 - Neither Agree

1 - Strongly

nor

5 - Strongly

Disagree

2 - Disagree

Disagree

4 - Agree

Agree

Today, my leader helped me to develop my strengths.

		3 - Neither Agree		
1 - Strongly		nor		5 - Strongly
Disagree	2 - Disagree	Disagree	4 - Agree	Agree

Today, my leader emphasized the importance of having a collective sense of mission.

		3 - Neither Agree		
1 - Strongly		nor		5 - Strongly
Disagree	2 - Disagree	Disagree	4 - Agree	Agree

Today, my leader expressed confidence that goals would be achieved.

		3 - Neither Agree		
1 - Strongly		nor		5 - Strongly
Disagree	2 - Disagree	Disagree	4 - Agree	Agree

## APPENDIX D. DAILY FATIGUE

Physical fatigue involves extreme physical tiredness and an inability to engage in physical activity.

Please rate the following on a scale of 1 to 5, with 1 being totally disagree and 5 being totally agree. These are in regards to your day TODAY.

Right now, I would have difficulty engaging in physical activity.

Neither Agree

nor

Totally Disagree

Disagree -

- 1

Disagree - 2

3

Agree - 4

Totally Agree - 5

I feel physically worn out right now.

Neither Agree

nor

Totally Disagree

Disagree -

- 1

Disagree - 2

3

Agree - 4

Totally Agree - 5



Right now, I want to avoid anything that will take too much physical energy.

Neither Agree				
nor				
Totally Disagree	Disagree -			
- 1	Disagree - 2	3	Agree - 4	Totally Agree - 5

Mental fatigue involves extreme mental tiredness and an inability to think or concentrate.

Please rate the following on a scale of 1 to 5, with 1 being totally disagree and 5 being totally agree. These are in regards to your day TODAY.

Right now, I have difficulty thinking and concentrating.

Neither Agree				
nor				
Totally Disagree	Disagree -			
- 1	Disagree - 2	3	Agree - 4	Totally Agree - 5

Right now, I feel mentally worn out.

Neither Agree

nor

Totally Disagree

Disagree -

- 1

Disagree - 2

3

Agree - 4

Totally Agree - 5

Right now, I want to avoid anything that will take too much mental energy.

Neither Agree

nor

Totally Disagree

Disagree -

- 1

Disagree - 2

3

Agree - 4

Totally Agree - 5

Emotional fatigue involves extreme emotional tiredness and an inability to feel or show emotions.

Please rate the following on a scale of 1 to 5, with 1 being totally disagree and 5 being totally agree. These are in regards to your day TODAY.

I am now going to have difficulty showing and dealing with emotions.

Neither Agree				
nor				
Totally Disagree	Disagree -			
- 1	Disagree - 2	3	Agree - 4	Totally Agree - 5

Right now, I feel emotionally worn out.

Neither Agree				
nor				
Totally Disagree	Disagree -			
- 1	Disagree - 2	3	Agree - 4	Totally Agree - 5

Right now, I want to avoid anything that will take too much emotional energy.

Totally Disagree -	Neither Agree nor			
1	Disagree - 2	Disagree - 3	Agree - 4	Totally Agree - 5

## APPENDIX E. SLEEP HYGIENE INDEX

The next set of questions are in regards to your sleep hygiene habits **yesterday**.

**Yesterday I...**

took a nap lasting two or more hours.

Yes

No

exercised to the point of sweating within 1 hour of going to bed.

Yes

No

used alcohol, tobacco, or caffeine within 4 hours of going to bed or after going to bed.

Yes

No

did something that may wake me up before bedtime (for example: play video games, use the internet, or clean) within 1 hour of going to bed.

Yes

No

went to bed feeling stressed, upset, angry, or nervous.

Yes

No

used my bed for things other than sleeping or sex (for example: watch television, read, eat, or study) within 1 hour of going to bed.

Yes

No

slept on an uncomfortable bed (for example: poor mattress or pillow, too much or not enough blankets).

Yes

No

slept in an uncomfortable bedroom (for example: too bright, too stuffy, too hot, too cold, or too noisy).

Yes

No

did important work within 1 hour of bedtime (for example: paid bills, scheduled things, or studied).

Yes

No

thought, planned, or worried while in bed.

Yes

No

went to bed at a different time than normal.

Yes

No

The next set of questions are in regards to your sleep hygiene habits **this morning**.

**This morning, I...**

got out of bed at a different time than normal.

Yes

No

**This morning, I...**

stayed in bed longer than I should have.

Yes

No



## APPENDIX F. SLEEP QUALITY AND SLEEP QUANTITY

Q21

The following set of questions are in regards to your sleep **last night**. Please answer them to the best of your ability. It is okay to estimate if you do not know exact times.

What time did you get into bed?

Hour: \_\_\_\_\_ Minute: \_\_\_\_\_ AM/PM

How long did it take you to fall asleep?

Hours: \_\_\_\_\_ Minutes: \_\_\_\_\_

What time did you try to fall asleep?

Hour: \_\_\_\_\_ Minute: \_\_\_\_\_ AM/PM

How many times did you wake up, not counting your final awakening?

\_\_\_\_\_

In total minutes, how long did these awakenings last? For example, if you woke 3 times for 20 minutes, 35 minutes, and 15 minutes, add them all up ( $20+35+15=70$  min).

Minutes: \_\_\_\_\_

What time was your final awakening?

Hour: \_\_\_\_\_ Minute: \_\_\_\_\_ AM/PM

What time did you get out of bed?

Hour: \_\_\_\_\_ Minute: \_\_\_\_\_ AM/PM

On a scale from 0-10, how would you rate the quality of your sleep **last night**? "Sleep Quality" is your sense of whether your sleep was good or poor. On this scale a 0 indicates "Very Poor Quality" and a 10 indicates "Very High Quality."

Very Poor Quality

Very High Quality

1

2

3

4

5

6

7

8

9

10

Sleep Quality Rating											
-------------------------	--	--	--	--	--	--	--	--	--	--	--

## **APPENDIX B. RESEARCHER SCRIPT**

**“Thank you for completing the baseline measurement survey. This study will take place over the next 10 work days and will require you to fill out surveys similar to the one you just completed, 3 times a day. These surveys will be shorter than the one you just completed and will take about 10 minutes to complete. They will sent out via the Expiwell app on your cell phone. Please take care to fill out each survey to the best of your ability.**

**Now we will get you set up on the Expiwell app. Please take out your phone, and download the FREE Expiwell app from the Apple or Android app store. Create an account, and please note that this information does not come to us nor is it used by us for this study. When prompted, please enable notifications for this app on your phone so that you will be notified when it is time to complete surveys.**

**Finally, click “Add an Experience (or the plus sign button on the experiences page)” and use Experience code \_\_\_\_\_ to register for the study. The app will send you notifications to complete the daily surveys.**

**The Expiwell app will send you a link to each survey. Simply follow the links the app provides and complete each survey during the appropriate time windows.**

**As long as you complete the survey at that link, you will be credited for completion of the survey, even if you don’t click the “Done” button that the Expiwell app shows. Expiwell might say you have not completed a survey, but as long as you complete the survey sent to you in the provided link, you WILL receive credit and payment for completion.**

**The first survey should be filled out in the morning, before work, between 5 am and 10 am, the second should be completed after the completion of you workday, before you leave, between 3 pm and 8 pm, and the final survey should be done right before you go to bed at night between 8 pm and 1 am. Although the survey reminder will be sent at the beginning of each time window, please only fill them out as they correspond to YOUR day. For example, although the bedtime survey is sent out beginning at 8:00 pm, please only fill it out right before you go to bed, which might be later than 8:00 pm. If you miss a survey window, you won’t be compensated for completion for that survey.**

**Again, you will be compensated for your participation in this study. Those who complete the study without any missing data will receive \$75 each. You will be paid \$15 for attending this baseline meeting. In addition, you will be paid \$2.50 for each completed set of surveys and will receive a \$10 bonus for completing all of the surveys without missing a time point.**

**If you miss a survey, please continue to fill out surveys to the best of your ability. The surveys will ask questions regarding some of your health behaviors, your mood, and about your workday. Questions will include things about fatigue, alcohol, tobacco, eating behavior, exercise, sleep outcomes, and your leader’s behavior at**

work. If some of these questions are not relevant to your day that day, there are options in each survey to indicate this. For example, if you did not happen to interact with your leader in any way that day or did not participate in any exercise, there will be a place in the survey to indicate this.

Please do your best to fill out surveys during the allotted time slots in order that we may gather accurate data. It may be helpful to set a reminder on your phone or computer to remember to complete the surveys or to pair filling out surveys with parts of your daily routine. Make sure to fill out each survey once per time point.

Just to reiterate, you will be compensated for your participation in this study. Those who complete the study without any missing data will receive \$75 each. You will be paid \$15 for attending this baseline meeting. In addition, you will be paid \$2.50 for each completed set of surveys and will receive a \$10 bonus for completing all of the surveys without missing a time point. Your compensation will be in the form of check from GA Tech mailed to your mailing address that you provided and should arrive within 60 days.

Now, we are going to address some of questions you might see in the daily surveys that may need clarification:

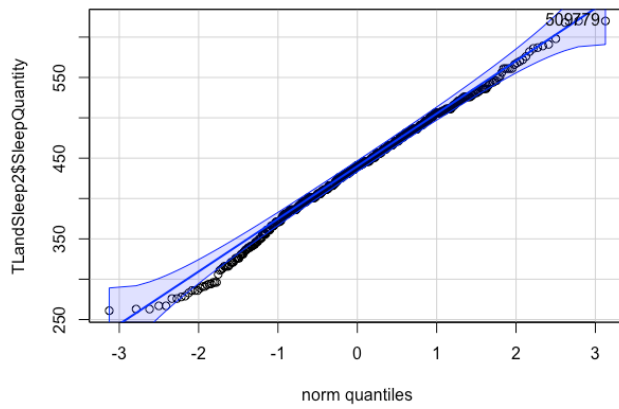
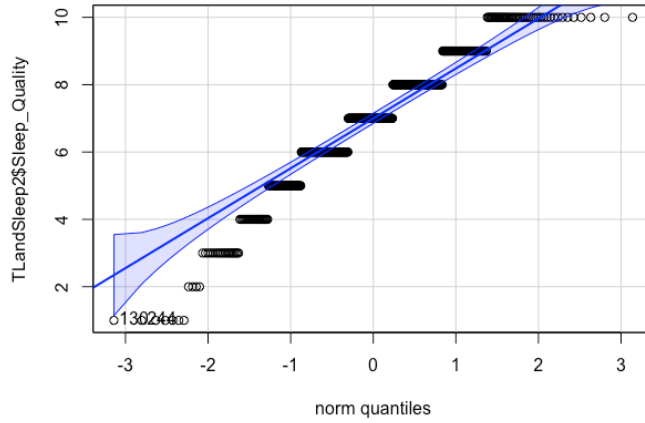
1. For the very first survey, you will receive an after work survey FIRST.
2. Additionally, you will receive a morning survey each morning AFTER a work day, including weekends. For example, if you work Monday-Friday, you will receive a morning survey on Saturday morning, but will NOT receive a morning survey on Monday morning because you did not work the previous day, Sunday.
3. Your workplace “leader” is defined as your immediate supervisor or direct report at work that day. If this changes from day to day, such as a shift manager, go off of who was your supervisor that day for each day.
4. If you work multiple jobs, only fill out your surveys with regard to your primary job.
5. When you are asked how many times you woke up during the night, this includes number of times you woke up to check your phone, use the bathroom, get water, check on children, etc.

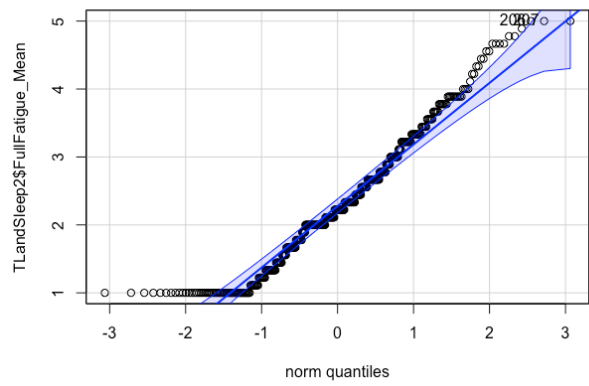
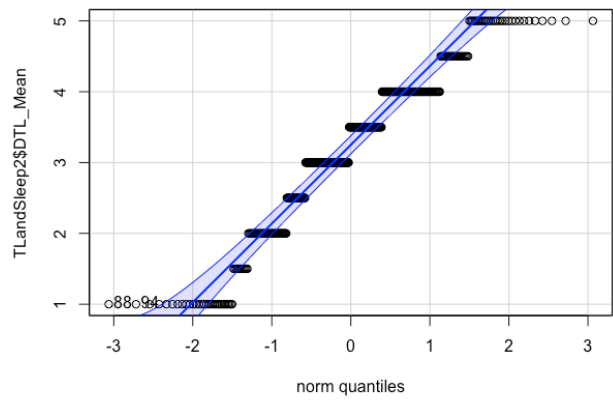
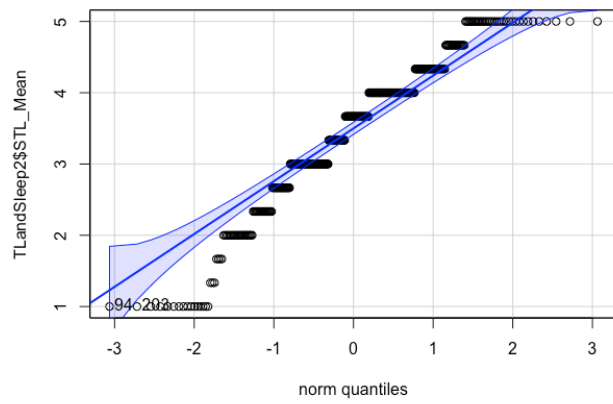
**Do you have any questions?”**

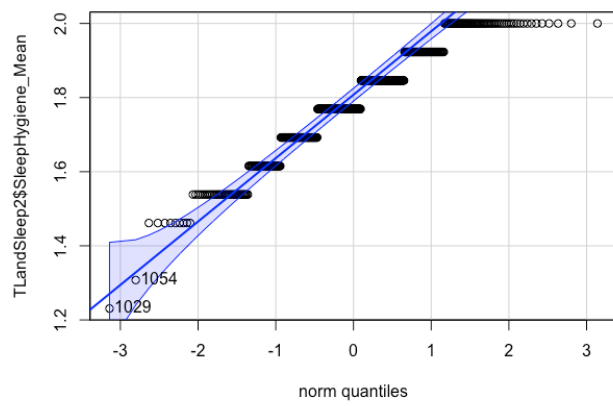
*Answer any questions.*

## APPENDIX H. Q-Q PLOTS

### Q-Q Plots for Variables of Interest



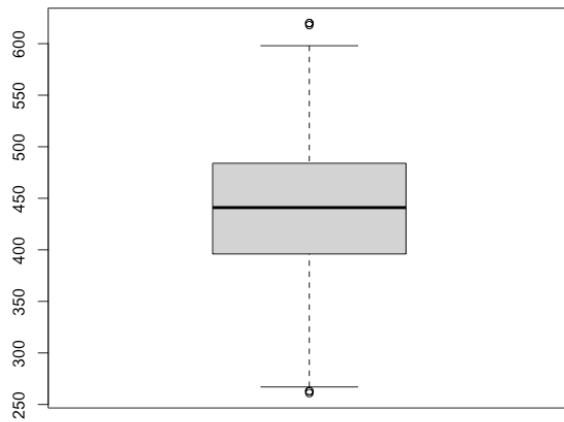




## APPENDIX I. BOX AND WHISKER PLOTS

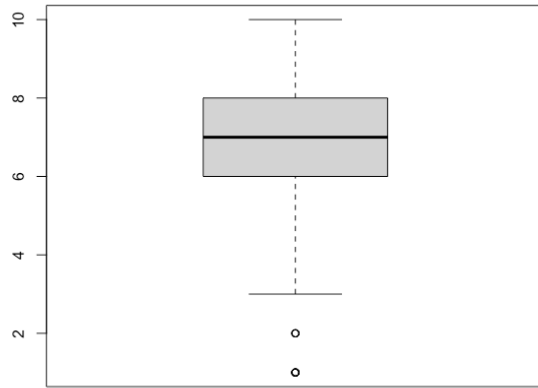
### Homogeneity of Variance – Box and Whisker plots

-Sleep Quantity

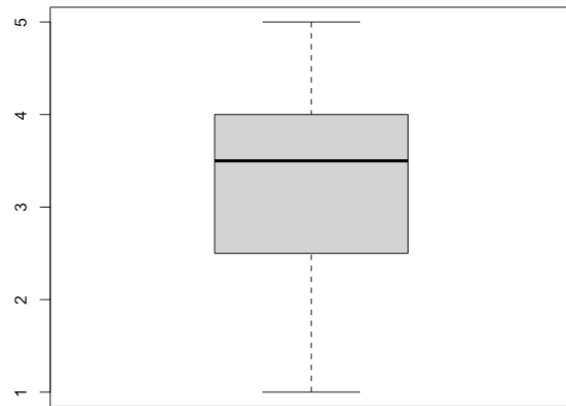


-Sleep Quality

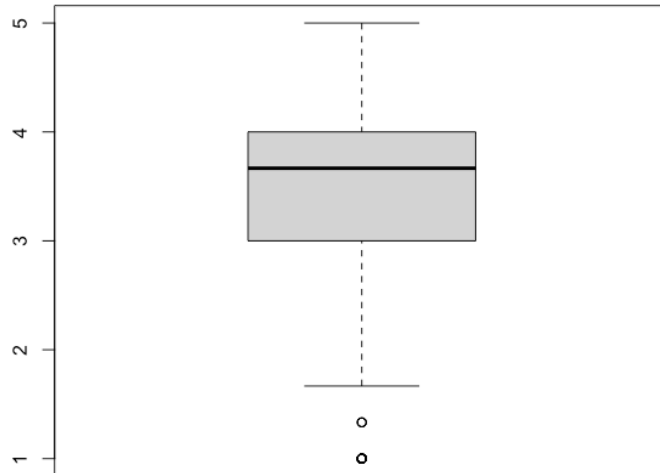




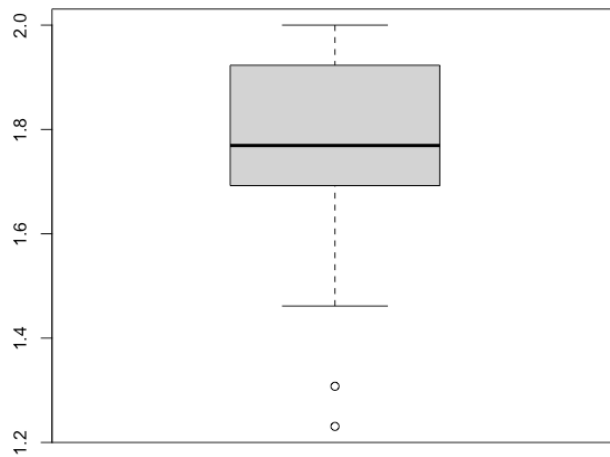
-Demanding Transformational Leadership



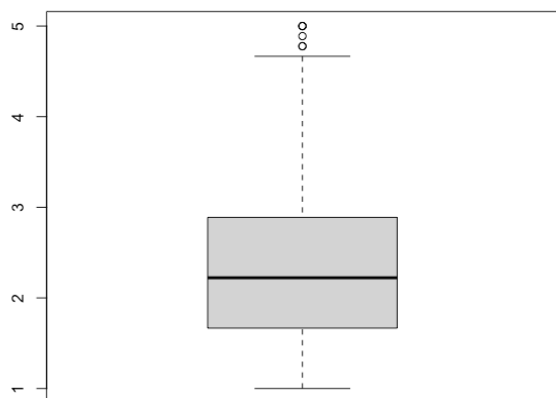
-Supportive Transformational Leadership



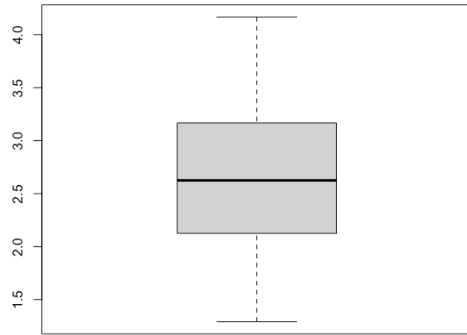
-Sleep Hygiene



-Fatigue



-Neuroticism



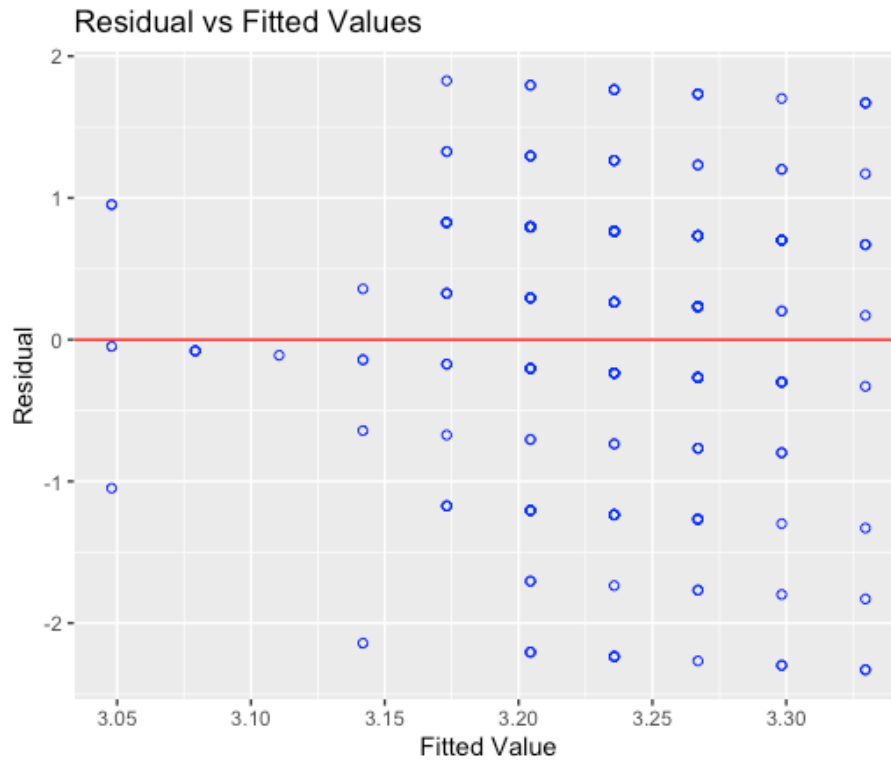
## APPENDIX J. PREDICTED V RESIDUALS

Scatterplots of predicted vs residuals

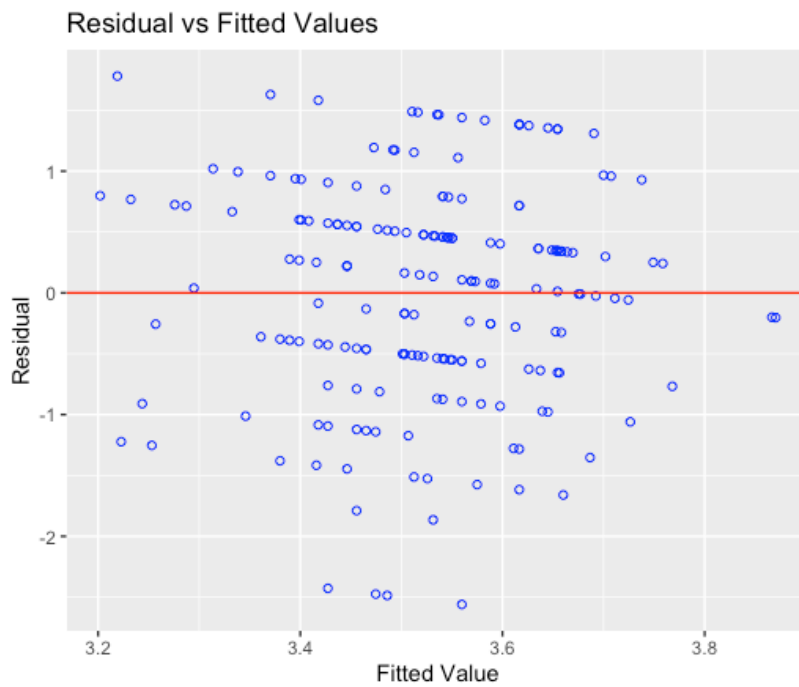
-DTL and Sleep Quantity



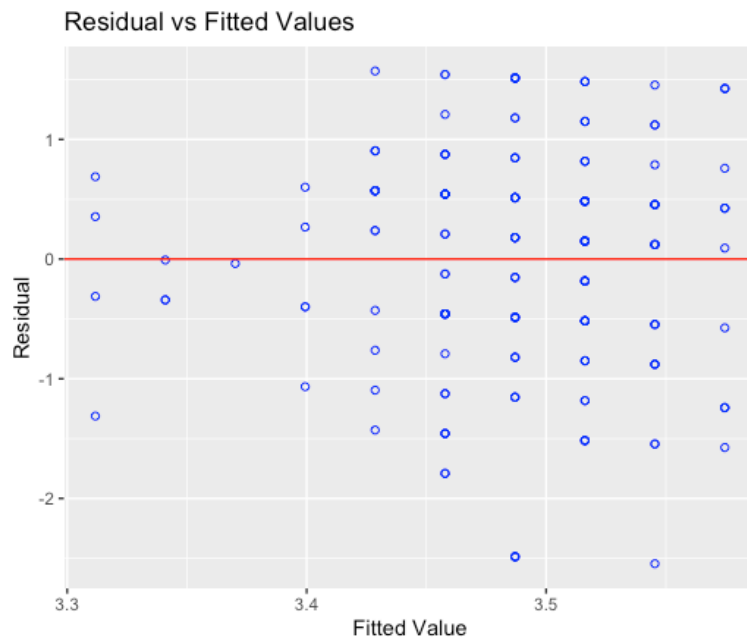
-DTL and Sleep Quality



-STL and Sleep Quantity



-STL and Sleep Quality



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