

Examining Factors in Presenteeism and Absenteeism: Physical Activity Rates and Mental Health Related Predictors of Productivity Loss in a Mining Population

by

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Abstract

Canadian companies are estimated to lose \$16 billion in work productivity per year from workers calling in sick due to mental health issues (Mercer, 2018). Impacts in work productivity are commonly reflected in rates of absenteeism and presenteeism. This study uses data gathered on the Mining Mental Health Study to evaluate this issue in a Northern Ontario Mining Population by identifying predictors of mental health-related and physical health-related productivity loss. Previously receiving mental health treatments or taking mental health medication were the leading causes of mental health-related work productivity loss, while a physical disease diagnosis was the leading cause of physical health-related work productivity loss. Depression symptom severity was significant in predicting instances of both absenteeism and presenteeism. Interventions in this population should focus on providing resources to lower depression symptom severity and be peer-based, as to help overcome any existing mental health stigma in this male dominated industry (Sayers et al., 2019).

Keywords: Absenteeism, Presenteeism, Mental Health, Physical Health, Work Productivity, Mining Industry, Physical Activity, Occupational Health Psychology

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Chapter One: Introduction

Historically, mental health issues have been overlooked in the workplace compared to physical problems. Indeed, there is an expectation in most jobs that physical health is the singular prerequisite for productive employment. This framework fails to acknowledge the importance of mental health and the interdependence between mental and physical health. Not only does poor mental health cause significant suffering, but it also costs the Canadian economy an estimated \$51 billion annually (Mercer, 2018). This includes the costs of work disruption and health care (Lim, et al., 2008; Wang & Karpinski, 2016). In Canada, it is estimated that two out of every nine workers suffer from a mental illness that impacts their work productivity each year (Smetanin et al., 2011). Impacts on work productivity are often reflected through rates of presenteeism and absenteeism.

Absenteeism refers to an employee missing work, while presenteeism refers to an employee who attends work while unable to fully perform their duties as a result illness or other reasons (Bierla, Huver & Richard, 2013). Canadian companies lose approximately \$16 billion in work productivity per year from workers absenteeism due to mental health issues (Mental Health Commission of Canada, 2015a; Mercer, 2018). Moreover, almost 30% of all disability claims are related to mental health issues (Sutherland & Stonebridge, 2015). Psychological health issues resulted in the highest number of average workdays lost on short-term disability claims followed by heart disease, back pain, hypertension, and diabetes (Workplace Safety North, 2018). Regarding mental health related disability claims, 78% of short-term claims and 67% of long-term claims can be attributed to problems associated with stress or depression (Workplace Safety North, 2018). Depression issues can be especially problematic as approximately one half of all

workplaces lost productive time in the United States as a result of depression (Starling Minds, 2018).

The prevalence of mental health issues in mining populations are elevated in comparison with the general population (Velander et al., 2010; Liu, Wang & Chen, 2014). During the mining mental health study (Lariviere & Hanson, 2019) of 2,224 mining workers in Ontario, researchers identified the prevalence of several mental health symptoms and sleep deficits among respondents. One common psychological condition in this sample was work-related burnout, which emerges after experiencing chronic interpersonal stressors on the job (Maslach & Leiter, 2016). Approximately 23.2% of subjects showed concerning levels of stress, 5.9% showed concerning levels of anxiety-related symptoms, and 12.5% showed concerning levels of depression-related symptoms (Larivière & Hanson, 2019).

Absenteeism and presenteeism are pervasive issues that exist across all lines of work (Baker-McClearn et al., 2010). However, the mining industry presents a unique environment that can exacerbate these issues. Mining is a male-dominated industry, which creates a machismo culture that reinforces stigma surrounding mental illness, and reduces employee help seeking behaviours (Tynan et al., 2018). When employees attempt to cope with problems internally, it increases the likelihood of them experiencing negative health outcomes resulting in further job impairments or longer durations of time off work (Ling et al., 2016; Asare-Doku et al., 2020). With employees across the mining industry commonly reporting high job demands, repetitive high strain tasks and long shifts, the mental toll can add up quickly (Salas et al., 2015; Asare-Doku et al., 2020). Despite this being true for all mining industry employees, production miners face even further risks when working under some type of incapacitation. Production miners perform duties such as drilling or blasting and face common

hazards including poor illumination, hot working conditions, overhead rock, and slippery terrain (Kenny et al., 2012). Due to the nature of blasting and the movement of heavy equipment, the terrain can change quickly and is often sloped or uneven making it difficult to traverse (Kenny et al., 2012). Slips, trips, and falls are common, but these risks are amplified when a worker is dealing with some sort of incapacitation. It is important to identify factors that are related to absenteeism and presenteeism in this industry to control for the elevated risks associated with working while incapacitated, and to avoid situations where employees miss work for an extended period (Baker-McCleary et al., 2010; Bierla et al., 2013; Fan & Smith, 2017).

The Mining Mental Health Report (Larivière & Hanson, 2019) laid groundwork for identifying key factors that are associated with presenteeism and absenteeism. The aim of this study is to expand on this effort with a specific focus on how various levels of physical activity, depression, anxiety, and stress play a role in presenteeism or absenteeism rates among mining industry workers. The biopsychosocial model (Engel, 1981) will be utilized to guide this research. Biopsychosocial models seek to explain individual health and illness through interactions between psychological, biological, and social processes (Howard & Howard, 2020). This approach has been commonly used in health psychology research (Suls & Rothman, 2004; Lehman et al., 2017; Howard & Howard, 2020) and to thoroughly understand phenomena as complex as absenteeism or presenteeism, biological, psychological, and social influences should all be considered. This study anticipates a significant relationship between levels of depression, stress, anxiety, physical activity, and indicators of lower work productivity. Further, it is hypothesized that these variables will all play a significant role in predicting an absence from work or an unengaged shift.

Chapter Two: Literature Review

This literature review has been organized into six sections. First, an overview of research on the relationship between physical activity and mental health outcomes will be provided. Next, research on physical activity and absenteeism will be presented. This will be followed by an overview of research on mental health and absenteeism. Section four and five will consider the relationship between physical activity and mental health on presenteeism, respectively. The final section discusses current research on the predictors of absenteeism and presenteeism in a mining population.

Physical Activity and Mental Health

While the physiological benefits of physical activity have been well established (Salmon, 2001; Arvidson et al., 2013; Stults-Kolehmainen & Sinha, 2014), there is considerably less literature on its psychological benefits (Salmon, 2001; Tajik et al., 2017). Although it is now self-evident that physical activity has a positive effect on mental health, a few issues remain unclear. For instance, there is uncertainty about the effect size of physical activity on indicators of mental health such as stress, depression, and anxiety (Salmon, 2001; Stults-Kolehmainen & Sinha, 2014). Also, the specific dose of physical activity required to create such benefits has been debated (Hamer, Stamatakis & Steptoe, 2009). Early research on physical activity and depression showed conflicting results (Tajik et al., 2017). Some data indicated that physical activity could have both positive and negative effects on depression depending on the intensity of the physical activity (McDonald & Hogdon, 1991; Cooper-Patrick et al., 1997; Craft & Landers, 1998). However, when exercise is matched with a participant's fitness level, results showed a positive relationship (Salmon, 2001). While both aerobic (Craft & Landers, 1998) and anaerobic exercise (Singh, Clements & Fiatarone, 1997) have been shown to be effective in reducing levels

of depression, aerobic exercise seems to be significantly more effective (Salmon, 2001). Physical activity has also been shown to have anxiolytic qualities as it allows highly anxious people to lower arousal levels (Clark, 1986). More recent research demonstrated there is a significant negative association between levels of anxiety, levels of stress and levels of physical activity (Tajik et al., 2017). The relationship between stress and physical activity was shown in multiple other studies with higher levels of physical activity being associated with lower levels of stress and depression (Toker & Biron, 2012; Cheung & Yip, 2015). As for research on the optimal intensity of exercise for mental health benefits, evidence suggests vigorous physical activity for bouts of at least 20 minutes, at a rate of 2-3 times per week is required for a mental health benefit to be present (Salmon, 2001; Conn et al., 2009). Furthermore, those who exercised three to five times a week, at an energy expenditure of at least 17.5kcal/kg/week, experienced significantly larger reductions in depressive symptoms than a placebo group (Dunn et al., 2005). Recent literature has supported moderate to vigorous exercise at a rate of three times per week as the optimal dose to experience a reduction in depressive symptoms (Paolucci et al., 2018). Other studies suggested there is no significant difference between light, moderate and vigorous physical activity, and that all exercise intensities have a similar effect in reducing symptoms of depression (Helgadottir et al., 2016; Meyer et al., 2016). The link identified between physical activity and mental health in this research suggests that an individuals' physical activity level plays a significant role in levels of stress, anxiety, and depression.

Although all jobs come with their own unique stressors, there are certain jobs that have more inherent stressors making it difficult for employees to cope. When employees are unable to cope with their employment-related stress, this results in a higher prevalence of depression and anxiety (Melchior et al., 2007). Elevated levels of stress over an extended period can also

contribute to work-related burnout (Maslach & Leiter, 2016). Researchers have found that jobs requiring excessive amounts of emotional labour are associated with higher levels of stress (Johnson et al., 2005; Delgado et al., 2017). In a comparison of twenty-six occupations, paramedics, teachers, police officers, prison officers and those working in social services or call centers, were identified as dealing with the highest levels of emotional labour (Johnson et al., 2005). The elevated stress levels associated with this, resulted in below average scores on measures of physical health, psychological wellbeing, job satisfaction and relationship satisfaction (Johnson et al., 2005; Delgado et al., 2017). Another variable that has been examined as a predictor of elevated vocational stress is shift schedule (Coffey, Skipper & Jung, 1988; Jamal, 2004; Rosa et al., 2019). Those who work a rotating shift schedule (Coffey et al., 1988), weekends (Jamal, 2004) or any non-standard work schedule (Jamal, 2004), experience significantly higher levels of stress than those on a fixed 9am to 5pm schedule (Jamal, 2004). Furthermore, a non-standard shift schedule puts employees at a higher risk of workplace injury (Dembe et al., 2006), and experiencing burnout (Jamal, 2004). A recent review in this area identified shift work as a risk factor for increased work-related errors, along with numerous psychological and physiological problems (Rosa et al., 2019). Those working night shifts were found to be at the highest risk due to changes in circadian rhythm (Rosa et al., 2019). In terms of mediating elevated workplace stress levels, the association between physical activity and stress has been established (Stults-Kolehmainen & Sinha, 2014). Researchers have demonstrated that workplace physical activity programs can be effective in reducing elevated occupational stress levels (Conn et al., 2009). It is common for those in the mining industry to work non-standard shift schedules and extended hours (Peetz & Murray, 2011), making it a priority to examine this relationship in the mining industry.

In the mining industry, available research on physical activity levels and mental health indicators is limited. Recently, a study of Australian miners found that employees who infrequently exercised were at a significantly higher risk of physical health complications, but there was no significant relationship found between psychological distress and physical activity levels (Asare et al., 2022). There is a gap in extant research in terms of the relationships between physical activity, stress, depression, and anxiety among mining industry workers. As a comparison, we can look at the nursing population, where rates of psychological distress are similar (Liu et al., 2014). One group of researchers found that a physical activity intervention did not have a significant effect on levels of anxiety, depression, or stress, but did improve fatigue levels and quality of life (Freitas et al., 2014). However, in this study the physical activity intervention only involved 10 minutes of exercise per day, which is insufficient based on other research (Salmon, 2001; Conn et al., 2009; Bernard et al., 2018). Other literature has clearly shown a link between levels of physical activity and levels of stress, depression, and anxiety (Clark 1986; Salmon, 2001; Toker and Biron, 2012). This relationship is dependent on the dose of physical activity being defined as challenging to the individual, but not overexerting (Conn et al., 2009). Furthermore, aerobic exercise seems to have more mental health benefits than anaerobic exercise (Craft and Lander, 1998; Salmon, 2001).

Physical Activity and Workplace Absenteeism

Absenteeism is a prevalent issue that is influenced by multiple factors (Lopez-Bonilla & Lopez-Bonilla, 2013). One factor that researchers have identified as playing a role in absenteeism, is an individual's level of physical activity (Proper et al., 2006). Early research showed increased levels of cardiovascular fitness in police officers was significantly associated with reduced absenteeism in males but not in females (Steinhardt, Greenhow & Stewart, 1991).

However, there was a small number of females in this study, and absences relating to pregnancy leave or childcare were included, which could have contributed to the nonsignificant result in females (Steinhardt et al., 1991). The amount of time spent sedentary at work also had a significant influence on work absences, with increased time spent sedentary leading to more absences (Steinhardt et al., 1991). This provides early evidence of a relationship between physical activity and absenteeism. Next, researchers have demonstrated that workers who participate in physical activities during their leisure time at least twice per week, reported significantly fewer work absences (14.8 vs 19.5 days/year) (Amelsvoort et al., 2006). In an investigation on the intensity of physical activity and work absences, no significant relationship was found between moderate physical activity and absenteeism (Proper et al., 2006). Vigorous physical activity was related to significantly fewer work absences (roughly one less absence each month) when conducted for at least 20 minutes, at a frequency of three times per week (Proper et al., 2006). Following an analysis on workplace physical activity interventions from 1969-2007, researchers concluded that physical activity interventions were associated with a significant reduction in absenteeism (Conn et al., 2009). These findings were supported by a review article that included results from 499 primary studies showing organizational physical activity programs led to a decrease in employee absenteeism (Bhui et al., 2012). Further analyses showed there was a significant relationship between physical activity levels and absenteeism, with vigorous physical activity at a frequency of 2-3 times per week reducing work absences up to 22 days per year (Kerner, Rakovac, & Lazinica, 2017).

Mental Health and Workplace Absenteeism

This section details how mental health issues can impact absenteeism. Mental health concerns that are associated with work absences are most often related to anxiety and depression

(Bhui et al., 2012) or high levels of stress (Brunner et al., 2019). One study considered 10 different behavioural risk factors and their impact on absenteeism in a population of 35,451 financial employees (Serxner, Gold & Bultman, 2001). Results showed that those deemed at risk of poor mental health based on an evaluation for depression, were 1.5 times more likely to experience a work absence than those who were not at risk (Serxner et al., 2001). Depression was the most significant risk factor of the 10 evaluated, with back pain, stress, weight, and smoking being the next most significant (Serxner et al., 2001). These findings were supported in a later study that showed work absence rates were 5% higher in workers who reported being in poor mental health, with job security being a moderating factor (Bubonya, Cobb-Clark & Wooden, 2017). When looking at depression and absenteeism, in a study involving 4953 participants, researchers found that there was a significant relationship between depression severity and mental health absences (Johnston et al., 2019). This demonstrated a dose-response relationship, with an increase in depressive symptoms leading to an increase in work absences. In an examination of anxiety and absenteeism, a review of 13 articles published between 2006-2016 concluded that elevated levels of anxiety had a significant impact on increased work absences (Ribeiro et al., 2019). Elevated anxiety levels were a further predictor of future unemployment (Ribeiro et al., 2019). These results suggest an additive effect between work absences and levels of anxiety, with anxiety contributing to work absences and work absences increasing anxiety levels (Ribeiro et al., 2019). Next, occupational stress levels were significantly associated with absenteeism and presenteeism, accounting for 23% of total health-related productivity loss in a Swiss working population (Brunner et al., 2019). This translated to \$200 lost per person per month. Occupational self-efficacy, along with coping resources available at work, were identified as buffers to this effect (Brunner et al., 2019). Feeling unwell due to stress was

identified as a significant predictor of absenteeism in a general working population (Wee et al., 2019), and elevated levels of perceived stress were associated with an increased frequency in illness days taken by public school teachers (Howard & Howard, 2020) in additional studies.

This literature demonstrates a relationship between employee mental health and absenteeism (Serxner et al., 2001; Brunner et al., 2019; Johnston et al., 2019). In another stressful line of work such as nursing, the link between poor mental health and absenteeism has been well established (Siu, 2002; Ticharwa, Cope & Murray, 2018; Gohar et al., 2020). More research is required to investigate the extent to which the same is true in a mining population (Lacey & Street, 2016). One key distinction between a nursing population and a mining population is that mining is a male dominated industry (Street et al., 2019; Sayers et al., 2019). In male dominated industries, help seeking behaviours are low and struggling employees attempt to cope with problems internally (Tynan et al., 2016). When employees are unable to cope, it can lead to negative health outcomes as evidenced by elevated suicide rates in mining populations (McPhedran & De Leo, 2013) and an increased duration in time off due to mental health claims (Chong & Collie, 2022). These issues highlight the importance of further investigating the relationship between indicators of poor mental health and absenteeism in the mining industry.

Physical Activity and Presenteeism

Presenteeism is an additional productivity loss related issue that can be influenced by a wide range of factors (Baker-McClearn et al., 2010). One factor identified in this research is physical activity rates. In a longitudinal study on health care workers researchers found that workers who self-reported higher levels of leisure time physical activity, reported significantly less instances of presenteeism, as tracked by the Work Ability Index (Arvidson et al., 2013). Next, Brown, Ryde, Gilson, Burton & Brown (2013) utilized the work limitations questionnaire

to measure presenteeism and an accelerometer to objectively measure activity levels over the course of 10 workdays. Results showed that employees who spent more time sedentary throughout the day (at work and home), reported significantly higher levels of presenteeism than those who engaged in at least light physical activity (Brown et al., 2013). These results show a relationship between physical activity levels and presenteeism, but they are also limited by a short study duration and small activity level variations among employees. A similar study evaluated sleep as an additional factor mediating activity levels and presenteeism (Guertler et al., 2015). Sleep was evaluated using questions adopted from the Pittsburgh Sleep Quality Index for quality and duration. The Workforce Sitting Questionnaire was used to evaluate sedentary time at work, and the Active Australia Survey was used to track physical activity rates. It was discovered that poor sleep quality and increased time spent sedentary was significantly associated with higher levels of presenteeism, while physical activity levels were not significant (Guertler et al., 2015). Although physical activity levels were not found to be statistically significant in this study, time spent sedentary per day was a significant predictor (Guertler et al., 2015). This suggests physical activity levels could still have an indirect impact on presenteeism (Guertler et al., 2015). Furthermore, there are several types of physical activities that were not tracked in this study. A study conducted on university employees did exactly this, by looking at the impact of self-reported cardiovascular training, strength training, and stretching behaviours to see how these activities influenced presenteeism rates (Walker et al., 2017a). Physical activity rates were tracked using a health assessment given to employees at the University of Texas. Employees were asked to report the frequency and intensity in which they engaged in at least 20 minutes of aerobic training, strength training, or stretching behaviours, on average, each week. Instances of presenteeism were measured using the Workplace Limitations Questionnaire.

Employees who participated in at least 5 days of moderate or 3 days of vigorous aerobic training each week, had significantly lower levels of presenteeism than those who did not (Walker et al., 2017a). Strength training and stretching behaviours were found to be unrelated to instances of presenteeism in this population (Walker et al., 2017a). The outcome of this study suggests that aerobic activity is the most effective form of physical activity in reducing presenteeism (Walker et al., 2017a). This is further supported by the positive impact aerobic physical activity has been shown to have on mental health (Salmon, 2001). Moreover, these researchers again used health assessments to track changes in physical activity rates over time in relation to instances of presenteeism (Walker et al., 2017b). In this longitudinal study, the physical activity types were combined from the previous study, and the researchers looked at changes in physical activity rates over three years to see how these changes impacted workplace limitations. It was found that baseline physical activity rates were not significantly related to presenteeism, but changes in physical activity rates were inversely related with changes in workplace limitations (Walker et al., 2017b). Employees who had increased their physical activity levels across the three years, experienced a significant decrease in workplace limitations, while those who decreased their physical activity levels experienced an increase in workplace limitations (Walker et al., 2017b).

The research discussed above shows that presenteeism is elevated in populations that experience poor sleep (Guertler et al., 2015) and that low physical activity levels are associated with increased work limitations (Walker et al., 2017a). It also demonstrated that increasing physical activity levels over time can significantly reduce workplace limitations (Walker et al., 2017b). In the mining sample of interest for this study, sleep deficits are common, and a majority of the population is overweight or obese (Larivière & Hanson, 2019). More research is required to uncover how these variables impact presenteeism in this population.

Mental Health and Presenteeism

Presenteeism is a multifaceted and ubiquitous issue that cuts across all lines of work (Baker-McClearn et al., 2010), making it is crucial to understand the role of employee mental health. One study in this area examined if a relationship existed between mood or anxiety disorders and presenteeism (Esposito et al., 2007). Researchers utilized random digit dialing to recruit a general population sample of 3345 participants in the Calgary area. The Stanford Presenteeism Scale was used to measure presenteeism. It was found that 75% of participants in the study who had comorbid mood and anxiety disorders reported interference with their work, compared to just 13.3% of participants without a disorder (Esposito et al., 2007). The impact of these disorders was greater in men than women and, those in the study who were suffering from a mood or anxiety disorder alone, surprisingly reported the lowest rates of presenteeism in the study (Esposito et al., 2007). Conflicting results such as these emphasize the need for further research addressing presenteeism and mental health (Esposito et al., 2007). Researchers have examined the relationship between levels of job stress, co-worker support, supervisor support and instances of presenteeism, (Yang et al., 2015), utilizing data from the Health and Retirement Survey in the United States. This survey contained a job stress scale, a co-worker support scale, a supervisor support scale, and a perceived ability to work scale, which was used to measure presenteeism. Researchers found that job stress had a significant effect on presenteeism, with higher job stress leading to higher levels of presenteeism (Yang et al., 2015). Co-worker support was found to have a significant mediating impact on presenteeism as well, with high levels of co-worker support leading to lower levels of presenteeism (Yang et al., 2015). Supervisor support did not have a significant effect on presenteeism in this study. These results are supported by a previously mentioned study, which found a significant relationship between occupational stress

levels and presenteeism (Brunner et al., 2019). A further study evaluated this relationship in greater detail and conceptualized two types of stress: hindrance stress and challenge stress (Yang et al., 2017). Challenge stress was classified as stress that a worker feels they can overcome on the job. This type of stress can be motivating and can improve job performance. Hindrance stress was defined as stress a worker feels they cannot overcome on the job and is harmful to job performance (Yang et al., 2017). Elevated levels of hindrance stress were found to be significantly related to higher levels of presenteeism, while levels of challenge stress were not significant (Yang et al., 2017). However, this study did find that levels of challenge stress were directly related to an individual's level of affective commitment within the organization (Yang et al., 2017). Employees who reported high levels of affective commitment, reported significantly fewer instances of presenteeism when compared with employees who reported low levels of affective commitment (Yang et al., 2017). This study demonstrates that the way an individual processes stress can have a direct impact on if the stress will lead to a drop in workplace productivity, as can their levels of emotional attachment to their organization (Yang et al., 2017). Next, since depression is highly prevalent in the general population (Furukawa et al., 2012) and presenteeism can occur in any line of work (Johnston et al., 2019), it is crucial to understand how these two variables might interact. Previous studies have already indicated that depression not only increases instances of absenteeism, but can impact an individual's ability to perform tasks at work as well (Johnston et al., 2009; Harvey et al., 2011). A similar study identified depression as the leading cause of workplace limitations among over 16,000 employees working in financial services; this was including physical ailments such as arthritis, heart disease, back pain, and diabetes (Burton et al., 2004). Early studies identified depression as a predictor and a recent study looked at depression severity, in relation to instances of presenteeism and absenteeism

(Johnston et al., 2019). Depression symptoms and severity were measured using the Patient Health Questionnaire, while instances of presenteeism were tracked using the Work Performance Questionnaire. Results of this study revealed there was a significant relationship present between depression severity, number of sickness absence days taken and occurrences of presenteeism at work (Johnston et al., 2019). In other words, the more severe the depressive symptoms, the more likely a person was to be absent or distracted from work (Johnston et al., 2019). Furthermore, the results of this study revealed that the cognitive symptoms of depression were largely associated with increased presenteeism, while the behavioural symptoms of depression were more associated with absenteeism (Johnston et al., 2019). This suggests that there is a relationship between depression severity and presenteeism levels (Johnston et al., 2019). Although these results suggest a positive relationship between depression symptom severity and workplace limitations, more research is needed to see if the same is true in the male dominated mining industry.

Absenteeism/Presenteeism Predictors in Mining Populations

Early research on absenteeism or presenteeism in a mining population focused on physical, behavioural, or environmental factors but in recent years, psychological factors have come to the forefront of this research. Recent studies suggest that being diagnosed with a mental health disorder (Yoshimoto et al., 2020) and higher distress levels (Ling et al., 2016) can have a significant impact on the frequency of work absences and presenteeism. However, other researchers in this area found that the mood of employees (Keyser, Adeoluwa & Fourie, 2019), and life satisfaction (Keyser, Adeoluwa & Fourie, 2020) had no impact on work productivity rates in the South African mining industry. However, it is important to note that although the

measures used in those studies are correlated with indicators of mental health, such as depression, anxiety, and stress, none of them measure the levels of those variables directly.

Researchers have shown that higher levels of stress, anxiety and depression were all found to significantly impair the productivity of Australian miners (Lacey & Street, 2016; Ling et al., 2016). More specifically, the miners' productivity was impaired due to higher instances of presenteeism and absenteeism (Lacey & Street, 2016). Additional analyses revealed that higher workplace stress levels had the largest impact on worker productivity (Lacey & Street, 2016) and that over 50% of the 897 employees who took part in a later study were interested in a workplace stress assistance program to increase productivity (Street, Lacey & Somoray, 2019). Ling et al., (2016) estimated that the annual value of the work-time lost due to psychological distress in the Australian mining industry totaled \$4.9 million. When looking at environmental factors, it was discovered that time spent working with dust, noise, vibration, hot temperatures and lifting heavy objects had no impact on absenteeism (Keyser et al., 2019). On the other hand, the amount of time spent working with hazardous materials did have a significant impact (Keyser et al., 2019) along with work-time pressure (Keyser et al., 2020).

Physical ailments have received the most attention historically in this literature. One study found that 50% of health-related work absences in Chilean miners were related to musculoskeletal disorders (Apud, 2012). Moreover, a study of Australian coal miners found that 80.5% of the 177 study participants reported experiencing regular pain in at least one area of their body (Carlisle & Parker, 2014). Low back pain was found to be the most common type of pain reported, and pain was found to be correlated with higher levels of psychological distress (Carlisle & Parker, 2014). Workers who reported suffering from low back pain reported the highest levels of psychological distress and absenteeism in this study (Carlisle & Parker, 2014).

Additionally, in Japanese miners, low back pain was identified as the most significant predictor of presenteeism, with neck pain and a mental health diagnosis being the next strongest predictors (Yoshimoto et al., 2020). Other physical issues that have been recognized as predictors of work absences in this population were related to weight. A Peruvian mining camp identified an increase in body-mass index as a predictor of work absences (Gomero et al., 2018). Further, researchers conducting a study on Chilean miners found that when compared with workers of normal weight, obese individuals were absent 25% more throughout the year, while those with morbid obesity were absent at an increased rate of 57% (Zarate et al., 2009). From a behavioural standpoint, smoking was shown to increase the risk of absenteeism in an Indonesian coal mine, along with the presence of low back pain (Widanarko, 2013). Furthermore, a review of lost-time injuries in the US mining sector identified workplace falls, electrical injuries, occupational experience, age, use of mining equipment and working underground as possible predictors of work absences due to injury (Nowrouzi-Kia et al., 2017). The researchers highlighted the current lack of research on mental health in this population, which emphasizes the need for additional work in this area (Nowrouzi-Kia et al., 2017).

Summary and Objectives

The literature discussed above highlights several key factors that must be considered when evaluating absenteeism and presenteeism in a mining population. It is clear that indicators of mental health are related to levels of work productivity (Johnson et al., 2019). High levels of depressive or stress-related symptoms were associated with increased levels of both absenteeism (Johnson et al., 2019; Brunner et al., 2019) and presenteeism (Yang et al., 2015; Johnson et al., 2019) in general populations. Stress was found to be the most significant predictor of productivity loss in an Australian mining population (Lacey & Street, 2016), and a mental health

diagnosis significantly increased instances of absenteeism and presenteeism in a Japanese mining population (Yoshimoto et al., 2020). This provides further evidence for the relationship between mental health and indicators of worker productivity. In male dominated industries such as mining, help seeking behaviors are low due to stigma, putting these populations at an increased risk (Tynan et al., 2016). In terms of strategies to reduce these impacts, physical activity interventions have been found to significantly improve employee mental health (Toker & Biron, 2012; Cheung & Yip, 2015; Tajik et al., 2017) and significantly reduce rates of absenteeism and presenteeism (Conn et al., 2009; Bhui et al., 2012; Walker et al., 2017b, Kerner et al., 2017).

This study builds on existing research and utilize data gathered on the Mining Mental Health Report (Larivière & Hanson, 2019) to explore if similar relationships exist in a Northern Ontario mining population. The main objective of this study is to identify what factors predict a work absence or an unengaged shift in this mining population. As a secondary objective, the impact of physical activity on work productivity was evaluated for efficacy in future preventative strategies. The results of this study will add to existing literature and improve our understanding of these relationships in a male dominated mining population. Additionally, the results of this study will be important to anyone working in occupational health and safety, as any predicting factors identified can be considered in the planning of future interventions.

Chapter Three: Methodology/Context

This project utilizes data that was gathered during the Mining Mental Health Study (Larivière & Hanson, 2019). Researchers used a cross sectional study design, and the study was launched in 2015 in partnership with Northern Ontario mining companies. Data collection began in 2016 and the study took place in Sudbury, Ontario, Canada. Sudbury is known as one of Canada's largest mining cities and is nicknamed the nickel capital of the world due to it being a leading producer of that mineral. There are currently upwards of 4,000 mining industry employees in Sudbury and mining operations have been ongoing in the city for over 100 years. The study was the first of its kind, given the amount of participation from the mining employees and the lack of mental health research on a Canadian mining population (Larivière & Hanson, 2019). In total, over 2,224 employees participated and completed the research instrument, which contained questions pertaining to a wide variety of mental health issues, allowing researchers the chance to thoroughly evaluate the current state of mental health in this sample. Initial findings showed that the workforce is dealing with concerning levels of stress, anxiety, and depression (Larivière & Hanson, 2019) as well as poor quality of sleep (Dennie et al., 2018). These findings were shared in 2019 at the Mining Health and Safety Conference (Larivière & Hanson, 2019). The current study analyzes the data that was gathered on the Mining Mental Health self-report questionnaires, with a specific focus on what factors were related to experiencing an unengaged work shift or an absence from work. This was evaluated using descriptive statistics and regression modelling. More detailed information on the statistical analyses is below.

Job Site	Number of participants	Job Responsibilities	Regular Physical Labour?	Works Underground?
Mine Sites	1,129 (50.8%)	Drill, blast, operate mining machinery. Perform duties relating to extracting ore or constructing passageways/shafts to facilitate mining operations	Yes	Yes
Milling and Smelting	442 (19.9%)		Yes	
Refining	256 (11.5%)		Yes	
Human Resources, Finance, Health, and Safety etc.	229 (10.3%)		No	
Production Services	158 (7.1%)		Yes	

Epistemology and Theoretical Stance

The epistemological stance guiding this research is positivism, which holds an empiricist view that knowledge stems from human experience (Collins, 2010). Positivists believe that science should aim to explain and predict in an objective way (Research Methodology, n.d.). The role of the researcher with a positivist approach is limited to collecting data and interpreting it without any subjectivity. Since this study plans to utilize quantitative data from standardized questionnaires, this approach is the most suitable. Positivist research adopts a deductive

approach, which starts with testable hypotheses that are confirmed or denied with testing (Crowther & Lancaster, 2008). In the context of this study, it is hypothesized that there will be a significant relationship found between physical activity levels, stress, depression, and anxiety. Furthermore, it is predicted that these variables will be shown to significantly predict rates of absenteeism and presenteeism in a mining population.

The biopsychosocial model was developed by researcher George Engel in 1977 after frustration with the lack of concern for psychosocial issues in the biomedical model (Engel, 1977). Biopsychosocial models are interdisciplinary and elucidate illness or disease through the interaction of psychological, biological, and social processes (Suls & Rothman, 2004). In the context of this study, predictors of work productivity will be selected that relate to the biological, psychological, and social health of employees. This will ensure that results provide a comprehensive overview of what precipitates a work absence or an unengaged shift in a Northern Ontario mining population.

Data Analysis and Quality Control

Analyses were completed with IBM® SPSS®. Descriptive statistics were computed for all study variables and stepwise regression modeling was used after a literature review to identify related factors for exploratory analysis. Ordinary least squares linear regression was used to verify if any study variables are relevant in predicting an absence from work or an unengaged shift. In total, there were four regression models created: one evaluating presenteeism, one evaluating mental health-related work absences, one evaluating physical health-related work absences and one evaluating total work absences. Due to the presenteeism variable being severely right skewed, a log transformation was used on this dependent variable to bring the data closer to a normal distribution. The significance of associations was established at a ≤ 0.05 p-

value with a 95% confidence interval and assumptions were checked for robustness. The multicollinearity assumption was checked using the variance inflation factor ($VIF < 10$). The linearity assumption was satisfied using observed vs. expected probability plots and homoscedasticity was established using a plot of the predicted vs. residual values. Listwise deletion was used for missing values. The variables that were used in this study and how they were measured on the questionnaire will be expanded on below.

Operational Measures

The following will describe how each variable of interest in this study was measured. Dependent variables in this study were related to absenteeism and presenteeism. More specifically, dependent variables included: mental health-related work absences, physical health-related work absences, total work absences and days attending work while ill. Independent variables of interest included: depression, stress, anxiety, physical activity, personal burnout, sleep quality, job satisfaction, alcohol abuse and job security. Binary independent variables included: receiving medical treatment, taking medication, caretaking for persons with a disability, having control over how work is organized, receiving adequate social support, maintaining enthusiasm, experiencing stigma at work and gender. These variables will all be expanded on below.

Dependent Variables

Absenteeism. On the Mining Mental Health Study questionnaire, items evaluating absenteeism were specified in four items. They involved self-reporting the number of days subjects were absent in the past year due to mental or physical health reasons. Questions were

also based on absences being related to a work-related issue or a non-work-related issue. In total, three variables evaluated absenteeism in this project. One variable measured mental-health related work absences by combining the self-reported work-related and non-work-related mental health absences in the year leading up to the study. The same was done for physical-health related work absences. A third absenteeism variable was created to reflect total absences by combining the mental health-related and physical health-related absences in the past year. These three variables were used as the dependent variables for the first three linear regression models, respectively. Please see appendix A for full absenteeism questions.

Presenteeism. Presenteeism was evaluated on the mining mental health questionnaire by having participants self-report the number of days in the year leading up to the study that they attended work while they were ill or injured. This variable was heavily right skewed, meaning a large proportion of scores were clustered around the left tail of the distribution making it a non-normal distribution. A log transformation was done to normalize the distribution prior to it being used as a dependent variable in the fourth regression model. Please see appendix A for more information.

Independent Variables

Depression. Symptoms of depression were assessed using the Beck Depression Inventory II (BDI-II). The BDI-II (Beck et al., 1996) is a widely used tool that evaluates twenty symptoms of depression on a scale ranging from 0–3 based on feelings in the past two weeks. A score of 0 would indicate that the symptom was not experienced by the individual and a score of 3 would indicate that the symptom was strongly experienced. Scores from all symptoms are added up and interpreted as follows: 1-10 is normal, 11-16 indicates mild depression, 17-20 indicates borderline clinical depression, 21-30 indicates moderate depression, 31-40 indicates

severe depression and a score above 41 is categorized as extreme depression. Depression symptom severity is highly associated with both absenteeism and presenteeism in related literature, making it a key variable of interest in this study (Johnston et al., 2019; Serxner et al., 2001).

Anxiety. Symptoms of anxiety were assessed using the Beck Anxiety Inventory (BAI). Similar to the BDI-II, the BAI is a commonly used tool that evaluates twenty-one symptoms of anxiety on a scale ranging from 0–3 based on feelings in the past week (Beck & Steer, 1990). A score of 0 indicates not being bothered by that symptom at all, while a score of 3 indicates being severely bothered. Scores from all twenty-one symptoms are added up and interpreted as follows: 1-21 indicates low levels of anxiety, 22-35 indicates moderate levels of anxiety and thirty-six or more indicates severe levels of anxiety. Anxiety symptoms have previously been associated with absenteeism, making it an important variable to include in this study (Bhui et al., 2012).

Stress. Symptoms of stress were measured using the Perceived Stress Scale (Cohen et al., 1983). The perceived stress scale is another self-report measure that asks respondents to rank the frequency in which they have experienced a variety of stressful feelings in the past month on a scale of 0-4. A score of 0 indicates never experiencing that feeling, while a score of 4 indicates experiencing that feeling very often. A score ranging from 0-13 would be categorized as low perceived stress, a score of 14-26 would be categorized as moderate perceived stress and a score of 27-40 would be categorized as high perceived stress. A review of relevant literature demonstrated that higher stress levels lead to increased instances of absenteeism and presenteeism, making this another key variable of interest in this study (Bruner et al., 2019; Yang et al., 2017; Yang et al., 2015).

Personal Burnout. Symptoms of personal burnout were measured using a six question Likert-scale from the Copenhagen Burnout Inventory (Kristensen et al., 2005). Respondents self-reported the frequency in which they experienced the symptoms that were described in the question. Possible responses for each question were: 1 - never/almost never or to a very low degree, 2 - seldom or to a low degree, 3 - sometimes or somewhat, 4 - often or to a high degree and 5 - always or to a high degree. The Mining Mental Health Study found that this population was at an increased risk of developing burnout (Larivière & Hanson, 2019).

Physical Activity. Physical activity levels were addressed using three questions. The first question evaluated time spent sedentary by the employee at work or at leisure per day. The second question addressed activity levels at work by asking the number of hours spent doing moderate-vigorous physical activity at work each day. The final question addressed activity levels at leisure by asking the number of hours spent each week doing moderate-vigorous physical activity at leisure. Physical activity programs have previously been effective in reducing instances of absenteeism (Kerner, Rakovac, & Lazinica, 2017). Please see appendix B for full physical activity questions.

Sleep Quality. Sleep quality was measured on the Mining Mental Health Study using the Pittsburgh Sleep Quality Index (PSQI). The PSQI is a self-rated questionnaire, which assesses sleep quality and disturbances over a one-month period (Buysse et al., 1989). The questionnaire gives scores for seven different components of sleep: sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication and daytime dysfunction. The sum of these seven components are combined to represent a global sleep quality score. The PSQI was slightly modified for the Mining Mental Health survey, with five questions intended for the bed partner being excluded due to workers completing the survey on

company time. Initial results from the Mining Mental Health Study demonstrated that this population is suffering from sleep deficits and poor sleep quality has previously been linked to presenteeism (Larivière & Hanson, 2019; Guertler et al., 2015).

Job satisfaction. Job satisfaction was evaluated on the Mining Mental Health Questionnaire using five questions. These five questions were found in the job satisfaction subscale in the National Institute for Occupational Safety and Health Generic Job Stress Questionnaire (NIOSH, 2014). All items related to job satisfaction were reverse scored and added together for a total job satisfaction score. Initial results from the Mining Mental Health Study suggested that higher job satisfaction was associated with lower levels of depression (Larivière & Hanson, 2019).

Alcohol abuse. Alcohol abuse was assessed using the Alcohol Use Disorders Identification Test (AUDIT). The AUDIT was developed to screen for excessive drinking over a one-year period and consists of ten items (Babor et al., 2001). These items encapsulate alcohol-related issues, including consumption levels and behaviours. The ten items are scored on a Likert-scale that ranges from: 0 – never, 1 – less than monthly, 2 – monthly, 3 – weekly, and 4 – daily or almost daily. These items are added together to provide an alcohol sum score. The alcohol sum score was positively associated with increased levels of depression on the Mining Mental Health Report (Larivière & Hanson, 2019).

Job insecurity. Job insecurity was measured using the Job Insecurity Measure which contains 18 questions that are self-reported on a Likert-scale (O’Neill & Sevastos, 2013). Responses were scored as follows: 1 – strongly disagree, 2 – disagree, 3 – somewhat disagree, 4 – neutral, 5 – somewhat agree, 6 – agree and 7 – strongly agree. Scores were added together to

give a total job insecurity score. Job security has previously been connected to absenteeism as a moderating factor where higher levels of job security resulted in reduced work absences (Bubonya, Cobb-Clark & Wooden, 2017).

Binary Independent Variables

The following are binary variables on the Mining Mental Health Study where the participant would answer yes/no or agree/disagree to the statement/question.

Mental Health Treatment. Have you ever received treatment for a mental health disorder?

Mental Health Medication. Are you currently taking any medication for a mental health-related issue?

Physical Health Disease. In the past twelve months, have you been diagnosed with a physical health disease?

Physical Health Medication. Are you currently taking any medication for a physical health-related issue?

Caretaking. Do you have responsibility for the care of any other person with a disability on a regular basis?

Control Over Work Organization. I feel like I have some control over how I organize my work.

Workplace Stigma. I am being treated unfairly at work.

Support. I experience adequate support in difficult situations.

Enthusiasm. During the past month, has it been a problem for you to keep up enough enthusiasm to get things done?

Gender. Participants who chose to self-report their gender on the mining mental health report could identify as male or female. Females were coded with a value of 0 while males were coded with a value of 1.

Chapter Four: Results and Discussion

The following section will report descriptive statistics for our sample of a Northern Ontario mining population. Afterwards, each regression model output will be reported in detail.

Population Statistics

There were 2,224 respondents who worked across 25 different worksites in the Sudbury area. Participants had an average age of 43.6 years old, had an average of 17.2 years of mining experience and were 88.8% male. This sample was predominately Caucasian, with 93.6% identifying as Caucasian, 5.5% of respondents identifying as Aboriginal/First Nations, and 1.7% of the sample identifying with another Ethnic minority. The distribution of workers across different sites was 50.8% of respondents worked at mine sites, 19.9% worked in milling or smelting, 11.5% worked in refining, 10.3% worked in human resources, engineering, corporate or finance and 7.1% worked in production services. When combining work and leisure time, respondents averaged five hours of moderate to vigorous physical activity per day. However, according to body-mass index, 0.3% fell in the underweight category, 14.1% were in the normal weight category, 42.9% of the participants were in the overweight category, 29.8% were in the obesity category, 7.5% were in the moderate obesity category and 3.3% were in the severe obesity category. When looking at sleep data, the average hours of sleep per night among this sample was 6.1 hours for those working the day shift, 6.0 hours for those working an afternoon shift and 5.5 hours for those working the night shift. In terms of alcohol abuse, 22.9% of participants screened positively for hazardous drinking based on results from the AUDIT. When looking at mental health rates among the sample, 23.2% of participants showed concerning levels of stress, 12.5% showed concerning levels of depression and 5.9% showed concerning levels of anxiety based on the instruments listed above. In this sample, the average number of work absences per year was 6.28 days. In terms of worker productivity, the average rate of presenteeism was 17.83 days per year.

Mental Health-Related Absenteeism

	B	Std. Error	Beta	T	Sig.	Tolerance	VIF
Constant	-1.161	2.18		-5.320	.000		
Physical Health Absences	.186	.015	.259	12.247	.000	.952	1.051
BDI Level	.330	.096	.091	3.452	.001	.609	1.641
Alcohol Sum Score	.033	.018	.037	1.761	.078	.976	1.025
Mental Health Medication	1.811	.377	.115	4.809	.000	.751	1.332
Caretaking for Person with a Disability	.803	.327	.051	2.456	.014	.977	1.023
Physical Activity Per Day (Work and Leisure)	.043	.023	.039	1.874	.061	.968	1.033
Enthusiasm	.304	.129	.061	2.348	.019	.643	1.556
Mental Health Treatment	1.772	.244	.179	7.260	.000	.704	1.420

Table One: Mental Health-Related Absenteeism Linear Regression Coefficient Table

A linear regression model (N=1,840) was conducted to predict mental health-related absences based on eight independent variables that were earlier identified as significant during exploratory stepwise regression. The results showed a significant regression equation was found ($F [8,1832] = 63.95, p < 0.05$), with an R^2 value of .218, suggesting this model explains about 22% of the variance in the dependent variable. When looking at significant predictors, receiving previous mental health treatment ($B = 1.772, p < .000$) or taking mental health medication ($B = 1.811, p < .000$) resulted in the biggest increases in mental health-related absences. Those who received mental health treatment or were taking mental health medication, were predicted to be absent almost two extra days per year for mental health reasons. Next, BDI-II level was found to be significant ($B = .330, p < .001$). For each increase in BDI-II level, mental health related

<i>Constant</i>	3.523	.774		4.550	.000		
<i>Union Membership</i>	.622	.295	.047	2.113	.035	.924	1.082
<i>Physical Disease Diagnosis</i>	1.171	.303	.094	3.869	.000	.767	1.304
<i>Mental Health Absences</i>	.357	.030	.263	11.911	.000	.926	1.080
<i>Days Attended While Ill</i>	.022	.003	.153	7.039	.000	.949	1.054
<i>Physical Health-Related Medication</i>	.642	.334	.046	1.925	.054	.779	1.283
<i>Personal Burnout</i>	.015	.007	.052	2.290	.022	.877	1.140
<i>Adequate Support</i>	-.557	.282	-.044	-1.978	.048	.903	1.108
<i>Control Over How Work Is Organized</i>	-.671	.194	-0.79	-3.458	.001	.868	1.152

Table Two: Physical Health-Related Absenteeism Linear Regression Coefficient Table

A second linear regression model (N = 1,888) was completed to predict physical health-related absences based on eight independent variables that were earlier identified as significant during exploratory stepwise regression. The results showed a significant regression (F [8,1880] = 42.63, $p < .000 < 0.05$), with an R^2 value of .154, suggesting this model explains about 15% of variance on the dependent variable. In this sample, receiving a physical disease diagnosis (B = 1.171, $p < .000$) was the most significant predictor of an additional physical health-related absence, followed by experiencing a mental health-related absence (B = .357, $p < .000$) or being a union member (B = .622, $p < .035$). This result suggests members of a union saw physical health-related absences increase by .622 days per year, receiving a physical disease diagnosis resulted in

an increase of 1.171 physical-health related absences per year and every three mental health-related absences resulted in an additional physical health-related absence. Attending work while ill ($B = 0.22$, $p < .000$) and personal burnout score ($B = .015$, $p < .022$) were both found to have a significant positive association with physical health-related absences, but the effect sizes were minimal. Furthermore, receiving adequate support during challenging times ($B = -.557$, $p < .048$) and having control over how your work is organized ($B = -.671$, $p < .001$) both were mediating variables that were significantly associated with a reduction in physical health-related absences per year.

Total Absenteeism

	<i>B</i>	<i>Std. Error</i>	<i>Beta</i>	<i>T</i>	<i>Sig.</i>	<i>Tolerance</i>	<i>VIF</i>
<i>Constant</i>	-0.80	1.852		-0.43	.966		
<i>Perceived Stress Score</i>	.212	.546	.012	.388	.698	.652	1.535
<i>BAI Level</i>	1.160	.849	.040	1.367	.172	.758	1.320
<i>BDI Level</i>	.545	.261	.079	2.085	.037	.467	2.142
<i>Physical Activity (Work + Leisure)</i>	.215	.070	.093	3.082	.002	.767	1.304
<i>Days Attended While Ill</i>	.016	.005	.081	3.016	.003	.907	1.103
<i>Mental Health Treatment</i>	3.025	.576	.159	5.248	.000	.732	1.366
	<i>B</i>	<i>Std. Error</i>	<i>Beta</i>	<i>T</i>	<i>Sig.</i>	<i>Tolerance</i>	<i>VIF</i>
<i>Physical Disease Diagnosis</i>	2.066	.523	.118	3.953	.000	.758	1.319

<i>Sleep Component Sum</i>	.108	.090	.039	1.201	.230	.643	1.554
<i>Physical Health-Related Medication</i>	-.448	.571	-.023	-.785	.433	.765	1.307
<i>Mental Health-Related Medication</i>	3.208	.924	.102	3.472	.001	.772	1.295
<i>Union Membership</i>	.813	.548	.044	1.483	.138	.774	1.292
<i>Job Satisfaction Score</i>	-.209	.508	-.012	-.411	.681	.766	1.305
<i>Adequate Support</i>	-.755	.507	-.043	-1.489	.137	.825	1.212
<i>Gender</i>	.151	.707	.006	.213	.831	.778	1.302

Table Three: Total Absenteeism Linear Regression Coefficient Table

A third linear regression model (N=1,305) was created to predict total absences based on 14 independent variables that were earlier identified as significant during the first two regression models. The results showed a significant regression equation was found ($F [15,1290] = 13.79$, $p < .000 < 0.05$), with an R^2 value of .138, suggesting this model explains about 13.8% of variance on the dependent variable. This model identified taking medication for mental health reasons ($B = 3.208$, $p < .001$), receiving mental health treatment ($B = 3.025$, $p < .000$) and receiving a physical disease diagnosis in the past year ($B = 2.066$, $p < .000$) as the most significant predictors of future work absences in this sample. Those taking medication for mental health reasons, or receiving mental health treatment, were predicted to be absent an extra three days per year when compared with those who were not. A physical disease diagnosis in the past year resulted in a predicted increase of two work absences over the course of a year. Next, severity of depressive

symptoms, as indicated by the BDI-II ($B = .545, p < .037$), was found to be an additional significant predictor of work absences. This suggests that someone scoring in the extreme category on the BDI-II is estimated to experience three more work absences per year than someone who scored in the normal category. Hours spent per day completing moderate to vigorous physical activity, at work and at leisure, also significantly predicted future absences ($B = .215, p < .002$). However, when adjusting to look at hours spent completing moderate to vigorous physical activity at work and at leisure separately, results showed that leisure time physical activity was not a significant predictor while work time physical activity was. The last variable that was significantly associated with an increase in total work absences was days attended while ill ($B = .016, p < .003$). This estimates that in this sample, for every 10 incapacitated work shifts per year, workers will experience an additional absence from work. Levels of anxiety ($B = 1.160, p < .172$), union membership ($B = .813, p < .138$), sleep component sum score ($B = .108, p < .230$) and perceived stress score ($B = .212, p < .698$) were all positively associated with increased work absences although none of these associations were significant. Finally, receiving adequate support in difficult situations ($B = -.755, p < .137$), physical health medication ($B = -.448, p < .433$) and job satisfaction score ($B = -.209, p < .681$) were all found to be negatively associated with future work absences but none of these associations were statistically significant according to this model. Results for gender differences ($B = .151, p < .831$) suggest no significant differences between total work absences between males and females.

Presenteeism

	<i>B</i>	<i>Std. Error</i>	<i>Beta</i>	<i>T</i>	<i>Sig.</i>	<i>Tolerance</i>	<i>VIF</i>
<i>Constant</i>	.738	.103		7.184	.000		
<i>Perceived Stress Score</i>	-0.16	.030	-.017	-.523	.601	.647	1.547
<i>BAI Level</i>	.034	.045	.023	.750	.453	.757	1.322
<i>BDI Level</i>	.038	.014	.105	2.693	.007	.468	2.136
<i>Physical Disease Diagnosis</i>	.034	.028	.037	1.221	.222	.756	1.323
<i>Sleep Component Sum</i>	.014	.005	.097	2.944	.003	.647	1.546
<i>Physical Health Medication</i>	.049	.030	.049	1.609	.108	.776	1.289
<i>Mental Health Medication</i>	.046	.051	.027	.902	.367	.782	1.279
<i>Union Membership</i>	.084	.030	.086	2.813	.005	.764	1.308
<i>Job Satisfaction</i>	-.072	.028	-.081	-2.607	.009	.759	1.318
<i>Adequate Support</i>	.032	.027	.035	1.181	.238	.822	1.217
<i>Mental Health Treatment</i>	.059	.032	.058	1.855	.064	.720	1.389
<i>Total Absenteeism</i>	.010	.002	.180	6.304	.000	.870	1.149
<i>Physical Activity (Work and Leisure)</i>	.005	.004	.041	1.292	.197	.751	1.331
<i>Gender</i>	.093	.039	.068	2.376	.018	.784	1.305

Table Four: Presenteeism Linear Regression Coefficient Table

A fourth linear regression model (N=1,170) was conducted to predict instances of presenteeism throughout the year based on 14 independent variables that were earlier identified

as significant during the first two regression models. The results produced a significant regression equation ($F [15,1155] = 17.446, p <.000 < 0.05$), with an R^2 value of .185, suggesting this model explains about 18.5% of variance on the dependent variable. It is important to note that due to the dependent variable being severely right skewed, a log transformation was completed, and the new log variable was used as the dependent variable of this model. Data that is right skewed does not follow a normal distribution, which can make the results of significance testing untrustworthy. Using a log transformation assists by bringing the distribution of scores closer to a normal distribution. This improved the model fit according to linear regression assumptions but limits the conclusions that can be drawn from the data as the scale has been adjusted. Variables that were significantly associated with increased instances of presenteeism include: total work absences throughout the year ($B = .010, p <.000$), BDI-II level ($B = .038, p <.007$), sleep component sum score ($B = .014, p <.003$) and union membership ($B = .084, p <.005$). Job satisfaction score ($B = -0.72, p <.009$) had a significant negative association with days attended while ill throughout the year. Hours spent completing physical activity at work/leisure ($B = .005, p <.197$), anxiety levels ($B = .034, p <.453$), receiving a physical disease diagnosis in the past year ($B = .034, p <.222$), receiving treatment for a mental health-related issue ($B = .059, p <.064$), taking medication for a physical health-related issue ($B = .049, p <.108$), taking medication for a mental health-related issue ($B = .046, p <.367$) and receiving adequate support in difficult situations ($B = .032, p <.238$) were all positively associated with increased instances of presenteeism but none of these associations were significant in this model. Perceived stress ($B = -.016, p <.601$) had a negative association with instances of presenteeism but this association was not significant according to this model. Results for gender ($B = .093, p <.018$), suggest that males are more likely to attend work while ill when compared to females.

Summary

Before transitioning to the discussion, several key points from the results will be summarized below.

First, when evaluating mental and physical health-related absences individually, experiencing a mental health-related absence resulted in an increase in physical health-related absences and vice versa. This supports a reciprocal relationship between our physical and mental health.

Second, for mental health-related absences, the largest predictors were receiving previous mental health treatment or taking mental health-related medication, followed by caretaking for someone with a disability and depression symptom severity.

Third, a previous physical disease diagnosis was identified as the biggest predictor of a future physical health-related absence, followed by being a union member, attending work while ill and personal burnout. Having control over how your work is organized and experiencing adequate social support in difficult situations, were identified as mediating variables leading to a decrease in physical health-related work absences.

Fourth, for the model of total absenteeism, individual health factors including taking mental health-related medication, receiving previous mental health treatment, or being diagnosed with a physical disease were all significant predictors of future work absences. Depression symptom severity, attending work while ill and time spent completing moderate to vigorous physical activity per day were also identified as significant predictors. When separating work and leisure time physical activity, work-related moderate to vigorous physical activity remained

significant, while leisure time physical activity was not significant in predicting future work absences.

Fifth, for instances of presenteeism being male, depression symptom severity, sleep quality, total work absences and union membership were identified as significant predictors. Job satisfaction had a significant negative association with presenteeism, suggesting that those who are more satisfied with their position are more engaged at work.

Discussion

The following section will discuss the meaning of the results of this study and is divided into five sections. First, a brief overview of unique issues that employees face in the mining industry face will be presented. Next, mental health and productivity loss will be discussed followed by a section focused on physical health and productivity loss. Fourth, the impact of stigma and machismo culture in male dominated industries will be looked at. Finally, this section finishes by discussing the implications of these results for future productivity-based intervention strategies.

Mining Industry. When compared with other industries, the mining industry presents several unique issues that can influence the mental health of employees and their work productivity. Issues include being a male dominated industry, dealing with high job demands, working in remote locations, limited access to support services, long shifts, repetitive high-strain tasks, increased exposure to physical hazards, injury risks and suicide (McPhedran & De Leo, 2013; Salas et al., 2015; Asare-Doku et al., 2020). In relation to the issues listed above, employees in the mining industry experience elevated levels of depression, anxiety, and stress (Velandar et al., 2010; Liu et al., 2014; Considine et al., 2017; Bowers et al., 2018). This increases levels of psychological distress, decreasing workplace productivity through increased

absenteeism and presenteeism (Ling et al., 2016; Lacey & Street, 2016).

Mental Health and Productivity Loss. In this sample of a Northern Ontario mining population, it is evident that determinants of mental health are crucial in predicting workplace productivity. The largest predictors for both mental health-related absences and total workplace absences were receiving previous mental health treatments or taking a mental health-related medication. This supports previous research from a Japanese working population, where researchers identified receiving treatment for a mental illness as a leading cause of decreased workplace productivity (Yoshimoto et al., 2020). Next, depression severity was identified as a significant predictor of mental health-related absences, total work absences and work incapacitation. When comparing significant coefficients for both total absenteeism and presenteeism, depression severity is the only variable that is significant in both models. This demonstrates a positive association, with those experiencing more severe symptoms of depression also experiencing increased work absences or unengaged shifts. Johnston et al., (2019) previously identified this relationship in a population of 4,953 participants across multiple industries. Similarly, evidence from Australian mining populations has supported depression as a significant predictor in workplace productivity measures, but researchers reported stress as the leading cause of absenteeism and presenteeism (Lacey & Street, 2016; Ling et al., 2016). Stress levels were not found to significantly predict work productivity in our sample of Canadian miners. However, it is possible stress levels could be having an indirect impact on work productivity through the positive association previously found between stress levels and depression in the mining industry (Velandar et al., 2010). Another factor that has received little attention in the mining industry is the burden of being a primary caretaker for someone with a disability. Being the primary caretaker for a person with a disability was

associated with a significant increase in mental health-related work absences in this study. Although there is a gap in available literature surrounding caretaking and work productivity in the mining industry, this relationship can likely be explained by Edwards and Higgins (2009), who found that primary caretakers were at a significantly greater risk of experiencing a mental health problem than the general population.

Physical Health and Productivity Loss. In addition to mental health-related influences, there are several physical health-related factors that must be considered when examining workplace productivity in a Canadian mining population. The strongest predictor of physical health-related absences in this sample was receiving a physical disease diagnosis. A physical disease diagnosis was the third strongest predictor for total absences as well. This is problematic, as a few factors inherent to this population put them at an increased risk of developing a physical disease. First, most of this population are production miners who are commonly exposed to poor air quality, hazardous materials and high levels of heat or humidity, which can all contribute to developing a physical disease (Chong & Collie, 2022). Second, this population averages roughly six hours of sleep per night, which is well below the normal recommendation of eight hours (Covassin & Singh, 2016). Both short sleep duration and poor sleep quality have previously been associated with increased risk of physical disease (Covassin & Singh, 2016; Bin, 2016). Third, 83.5% of this population fell in the overweight or obese category according to body-mass index (BMI). Research has shown that an elevated BMI score in the overweight category or above, results in a significant increase in risk of disease diagnosis (Nordestgaard et al., 2012; Lu et al., 2014). Outside of physical disease risks, a further predictor of total work absences among this sample was time spent completing moderate to vigorous physical activity at work and leisure. This was surprising given that

physical activity interventions have previously been found to significantly reduce workplace absenteeism in multiple industries (Conn et al., 2009; Kerner et al., 2017). However, researchers evaluating an Australian mining population discovered a similar trend, with increased physical activity levels being unassociated with any improved health outcomes and suggested an unhealthy diet as a possible contributing factor (Bezzina et al., 2021). This idea has support from other related literature, as Malhotra et al., (2015) demonstrated that the negative consequences of a bad diet can outweigh the benefits of physical activity. Although health outcomes are complex with several contributing factors, any physical activity-based intervention in a mining population should be prudent to include an educational component on healthy eating habits to increase effectiveness (Bezzina et al., 2021). Finally, an additional significant predictor of physical health-related absences was mental health-related absences. This relationship supports the interdependence between our physical and mental health.

Mining and Male Dominated Industry Stigma. To evaluate the outlook for future workplace interventions in reducing absenteeism and presenteeism in this population, it is prudent to explore the significant relationship that was found between absenteeism and presenteeism. Regression results showed that attending work while ill was associated with an increase in total vocational absences throughout the year and vice versa. This relationship could be influenced by the stoic workplace culture that exists in the mining industry (Tynan et al., 2016). A machismo culture can pressure employees into working through minor ailments and reinforces existing stigma surrounding mental illness (Tynan et al., 2018). This could be partly responsible for why males experienced increased presenteeism when compared with females among this sample, as males are being influenced by this pressure. Mental health stigma can create a myriad of issues relating to work productivity and workplace interventions.

A stigmatizing attitude towards mental illness is one of the most common barriers to help seeking behaviours and prevents employees from receiving the support that they need (Brohan et al., 2010). In the mining industry, help seeking behaviors for psychological distress are low, but there have been some improvements coming from recent interventions in the Australian mining industry (Street et al., 2019; Sayers et al., 2019). Stress is the leading cause of impaired productivity among Australian miners (Lacey & Street, 2016) and in a sample of 897 employees, 52% indicated that they were interested in a stress management program (Street et al., 2019). Despite this, only 36% of employees in that sample who indicated being stressed all the time were interested in a stress assistance program, suggesting that intervention strategies need to target health promotion to engage employees who are at a high risk for impaired productivity (Street et al., 2019). Research from a separate Australian sample utilized a peer-based mental health intervention strategy and found that significantly more participants disagreed they would be treated differently due to mental illness when compared with a pre-intervention survey (Sayers et al., 2019). This exemplifies the efficacy for peer-based intervention strategies in reducing mental health stigma in this industry.

Implications for Future Productivity Based Interventions. It is essential for any intervention strategy in the mining industry targeting vocational productivity to address mental health stigma, as mental health claims are associated with the longest periods of absenteeism (Smith et al., 2014; Chong & Collie, 2022). This contributes to high economic costs for companies due to lost productive time; particularly when employees return to work before making a full recovery, which leads to further losses relating to presenteeism. For example, in an Australian mining sample of 1,456 subjects, it is estimated that psychological-related productivity losses totaled \$2.7 million for absenteeism and \$2.3 million for presenteeism in

2014 (Ling et al., 2016). Furthermore, it was estimated that mental health-related productivity losses cost the Australian coal mining industry \$153.8 million annually and roughly \$50,000 per high-risk employee (Ling et al., 2016; Street et al., 2019). In a general population of 2,754 Finnish factory workers, the total average costs for absenteeism and presenteeism was estimated to be \$5.1 million total (Vanni et al., 2017). This total is similar to the Australian mining sample, although the total from the mining sample is smaller and only includes psychological-related costs (Ling et al., 2016). For Canadian populations, in 2018 it was estimated that mental health-related absenteeism cost Canadian companies \$16.6 billion (Mercer, 2018). Data from the Northern Ontario mining population in our study showed that the average employee was absent from work between six and seven times per year. For contrast, we can look at absenteeism rates across other Canadian male dominated industries in 2015, the same year that our mining population reported on (Government of Canada, 2022). Those working in the agriculture industry averaged 3.3 days absent over the course of the year, while across all oil and gas, forestry, quarrying and mining employees, the average was 5.9 days absent in 2015 (Government of Canada, 2015). This suggests an increased rate of absenteeism among our Northern Ontario mining sample. Even so, the average of 6.28 days absent among study participants in 2015 may seem low to some, the average income in this sample was between \$80,000 - \$89,000. When these absences are augmented across thousands of employees, the value for lost productive time is substantial. This is without considering the added costs associated with presenteeism. Employees of this sample reported experiencing an unengaged shift between 17 and 18 times per year. Since level of incapacitation was unspecified in our study, an accurate estimate of productivity loss due to presenteeism cannot be given.

To lessen this financial burden and to improve employee health outcomes, there are multiple things to consider when planning future interventions to improve work productivity for this population. Since depression was the only variable significant in predicting both absenteeism and presenteeism, any intervention to reduce these productivity-related issues in this industry should focus on providing workers with resources and coping strategies that reduce the impacts of experiencing elevated symptoms of depressions. Providing employees with access to group cognitive behavioural therapy sessions (Nardi et al., 2017) or implementing a physical activity program (Tajik et al., 2017) have both shown effectiveness in reducing depressive symptoms. In addition, interventions should utilize a peer-based approach as this has previously been effective in reducing mental health-related stigma in mining communities (Sayers et al., 2019). Regarding absenteeism, special attention should be given to those who are taking a mental health-related medication, receiving mental health treatment or who have been diagnosed with a physical health-related disease. Finally, as sleep quality was significant in predicting presenteeism and this population exhibited sleep deficits, interventions should provide methods to address sleep issues to be most effective. Educational programs that stress sleep hygiene, fatigue management and modifying environmental factors such as poor lighting, have been associated with sleep quality improvements in other industries (Redeker et al., 2019). Based on results from this study, incorporating these factors will assist in reducing future absenteeism or presenteeism and will ensure a high return on investment when planning productivity-based interventions for this population.

Chapter Five: Conclusion

The conclusion section has been broken into three sections. The first section will discuss the significance of this study. Section two will go over the limitations of the current study results. Finally, the original study objectives will be reviewed during the last section with final thoughts for future research.

Significance

The findings of this study are relevant for several reasons. One, workplace productivity related phenomena are difficult to understand because they can be influenced by multiple factors (Lopez-Bonilla & Lopez-Bonilla, 2013). The findings of this project build on existing literature relating to absenteeism and presenteeism in the mining industry, which assists in understanding these complex phenomena. Increasing comprehension in this area is crucial due to potential financial losses for employers and to reduce negative health outcomes in employees. It is estimated that Canadian companies lose \$16 billion in productivity every year as a result of mental health issues alone (Mental Health Commission of Canada, 2015a; Mercer, 2018). From an employer perspective, if an intervention could lead to even a modest reduction in absenteeism or presenteeism, this would still amount to substantial savings when multiplied by many employees throughout a fiscal year (Conn et al., 2009). From an employee perspective, an intervention could lead to not only recouping wages that were lost to work absences, but also an increased overall state of health (Brunner et al., 2019). Next, this study highlighted that intervention strategies in this population should focus on reducing depressive symptoms through peer-based programs to help overcome existing mental-health related stigma. Male dominated industries have struggled to overcome this stigma, but with evidence of mental health claims on the rise (Smith et al., 2014; Tynan et al., 2016; Tynan et al., Sayers et al., 2019; Larivière &

Hanson, 2019), there is no better time to further address this area of research. A final consideration regarding the importance of this research is societal changes caused by the COVID-19 pandemic. COVID-19 has caused numerous work stoppages and mandatory isolation periods that have impacted the Canadian population over the last several years. These changes contributed to a deterioration in the mental health of Canadian adults (Gadermann et al., 2021), including an increase in symptoms of anxiety, depression, and suicidal ideations (Iftene et al., 2022). Other health behaviour changes in Canadian adults that could contribute to these findings is an increase in alcohol consumption, junk food consumption, and daily screen time since the start of the pandemic (Zajacova et al., 2020). Unsurprisingly, changes relating to the pandemic have also led to increased absenteeism across all major Canadian industries (Government of Canada, 2022). With negative health behaviours and absenteeism rates increasing among Canadian adults, this further emphasizes the need for research on absenteeism-related concerns, such as this study on a Northern Ontario mining population.

Limitations

There are a few limiting factors that need to be addressed pertaining to this study. First, the questionnaire used in the Mining Mental Health Study was a long self-report questionnaire, which can cause issues of participant fatigue (Lavrakas, 2008). Although participants may have chosen to skip certain questions when they are fatigued, the large population of this study will help control and lessen this impact. Secondly, the presenteeism measure used in this study does not specify the level of incapacitation that the employee is experiencing. This limits the conclusions that can be drawn from the results pertaining to presenteeism. Thirdly, items that tracked stigma on the Mining Mental Health Report were limiting. Questions focused on

identifying personal attitudes on if the individual has experienced stigma, as opposed to addressing their workplace attitudes towards people with mental illness.

Conclusion

The mining industry has elevated levels of vocational stress that can negatively impact the mental health of employees (Street et al., 2018), as exemplified by the higher rates of depressive symptoms experienced by miners when compared to the general population (Liu et al., 2014). This can have a significant effect on worker productivity, with workers who are suffering from mental health difficulties experiencing increased absenteeism and presenteeism (Johnston et al., 2019). These productivity loss issues can lead to substantial financial losses for employers (Mercer, 2018), and poor mental health outcomes for employees (Smetanin et al., 2011).

The main objective of this study was to identify what factors predict a work absence or an unengaged shift in a Northern Ontario mining population. This was successful, with results being broken down into more detail relating to mental health-related absences, physical health-related absences, total absences, and instances of presenteeism. For mental health-related absences, the largest predictors were receiving previous mental health treatment or taking mental health-related medication, followed by caretaking for someone with a disability and depression symptom severity. For a physical health-related absence, a previous physical disease diagnosis was identified as the biggest predictor, followed by being a union member, attending work while ill and experiencing symptoms of personal burnout. Having control over how your work is organized and experiencing adequate social support in difficult situations, were identified as mediating variables leading to a decrease in physical health-related work absences. For combined work absences, taking mental health-related medication, receiving previous mental

health treatment, being diagnosed with a physical disease, depression symptom severity, attending work while ill and time spent completing moderate to vigorous physical activity per day were all identified as significant predictors. Additionally, for instances of presenteeism being male, depression symptom severity, sleep quality, total work absences and union membership were identified as significant predictors. Job satisfaction had a significant negative association with presenteeism, suggesting that those who are more satisfied with their position are more engaged at work. The relationship found between total work absences and presenteeism is a finding that will be of importance to occupational health and safety professionals. When planning future preventative strategies in this industry, it will be crucial to ensure interventions are reducing rates of absenteeism without creating future patterns of presenteeism. It is also important to note that there was a reciprocal relationship found between mental and physical health-related absences, with experiencing a mental health-related absence resulting in an increase in physical health-related absences and vice versa.

When considering the biopsychosocial model in relation to the work productivity-related predictors that were identified in this study, there are a few things to consider. Broadly speaking, psychological health-related factors seemed to have the largest impact on work productivity, followed by biological health-related factors and then social health-related factors. However, as the biopsychosocial model suggests biological, psychological, and social processes interact in each of these variables. Depression symptom severity would be a good example of this, with questions on the BDI-II evaluating psychological symptoms such as feelings of sadness, biological symptoms such as tiredness, and social symptoms such as a loss of interest in activities. Additionally, social health-related factors could be underrepresented by these results, particularly those relating to stigma. According to a 2016 review, workplace mental health

stigma should be evaluated based on: workplace attitudes towards people with mental illness, recognition of signs of mental illness, supportive workplace behaviours and knowledge of mental disorders and their treatments (Hanisch et al., 2016). As earlier discussed, workplace mental health stigma can be a barrier to help seeking behaviour, which leads to negative employee health outcomes (Brohan et al., 2010; Street et al., 2019). More research is required to thoroughly understand the social construct of stigma and its impact in a Northern Ontario mining population.

As a secondary objective, the impact of physical activity on work productivity was evaluated. Time spent completing physical activity at work and at leisure was found to be unrelated to instances of presenteeism, mental-health-related absences and physical health-related absences individually, but was significant in predicting future work absences when the variables were combined. This result suggests that physical activity would be a poor preventive strategy to reduce future instances of absenteeism in this population, when separating physical activity at work and for leisure, work-related physical activity remained significant, while leisure time physical activity was not significant in predicting future work absences. Although this finding still does not indicate additional leisure time physical activity would lead to a reduction in work absences, it highlights the need for future research on this relationship in this population. Still, the significant relationship found between moderate to vigorous physical activity at work and future work absences implies that any physical activity-based intervention needs to pay special attention to those who already physically active at work, as to not exhaust them. More research is needed on this population to further evaluate this relationship and to thoroughly assess the efficacy of a physical activity-based intervention to improve productivity in a Northern Ontario mining population.

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Appendix A: Measures of Absenteeism and Presenteeism

Questions on the Mining Mental Health Study relating to absenteeism and presenteeism are listed below.

- 1- *During the past year about how many days (in total) were you absent from work due to work-related physical injury or illness?*
- 2- *During the past year, about how many days (in total) were you absent due to non-work-related physical injury or illness?*
- 3- *During the past year about how many days (in total) were you absent due to work-related mental health issues?*
- 4- *During the past year, about how many days (in total) were you absent due to non-work-related mental health issues?*
- 5- *During the past year, about how many days (in total) did you attend work while you were sick or ill?*

Appendix B: Measures of Physical Activity

Questions on the Mining Mental Health Study relating to physical activity rates are listed below.

- 1- *How much time do you usually spend sitting or reclining on a typical DAY? (Including at work, commuting, at home, sitting with friends, watching television, reading, etc. EXCLUDING SLEEP)*

- 2- *How much time do you spend doing moderate or vigorous intensity physical activity at work on a typical DAY?*

- 3- *How much time do you spend doing moderate or vigorous intensity leisure physical activity in a typical WEEK?*

Appendix C: Mental Health-Related Absenteeism Residual Outputs

Table C1

Residuals Statistics^a					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-1.61	12.00	1.75	2.116	1331
Residual	-11.122	32.054	.000	4.134	1331
Std. Predicted Value	-1.587	4.844	.000	1.000	1331
Std. Residual	-2.676	7.713	.000	.995	1331

a. Dependent Variable: sum of recoded absnonwmental and abswmen

Figure C1

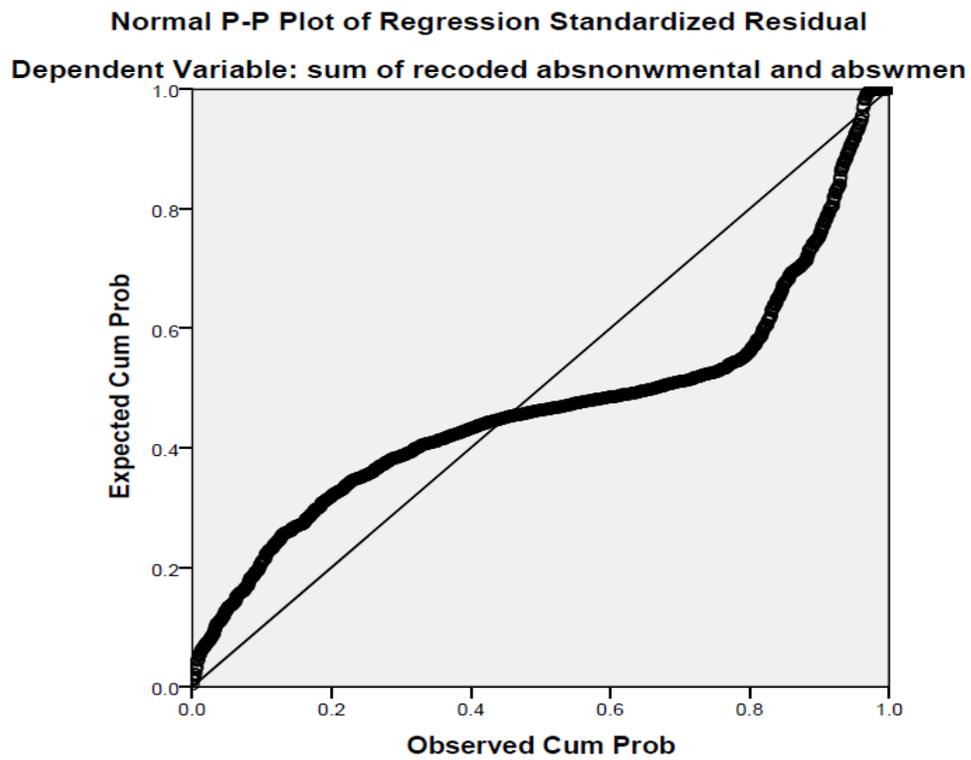
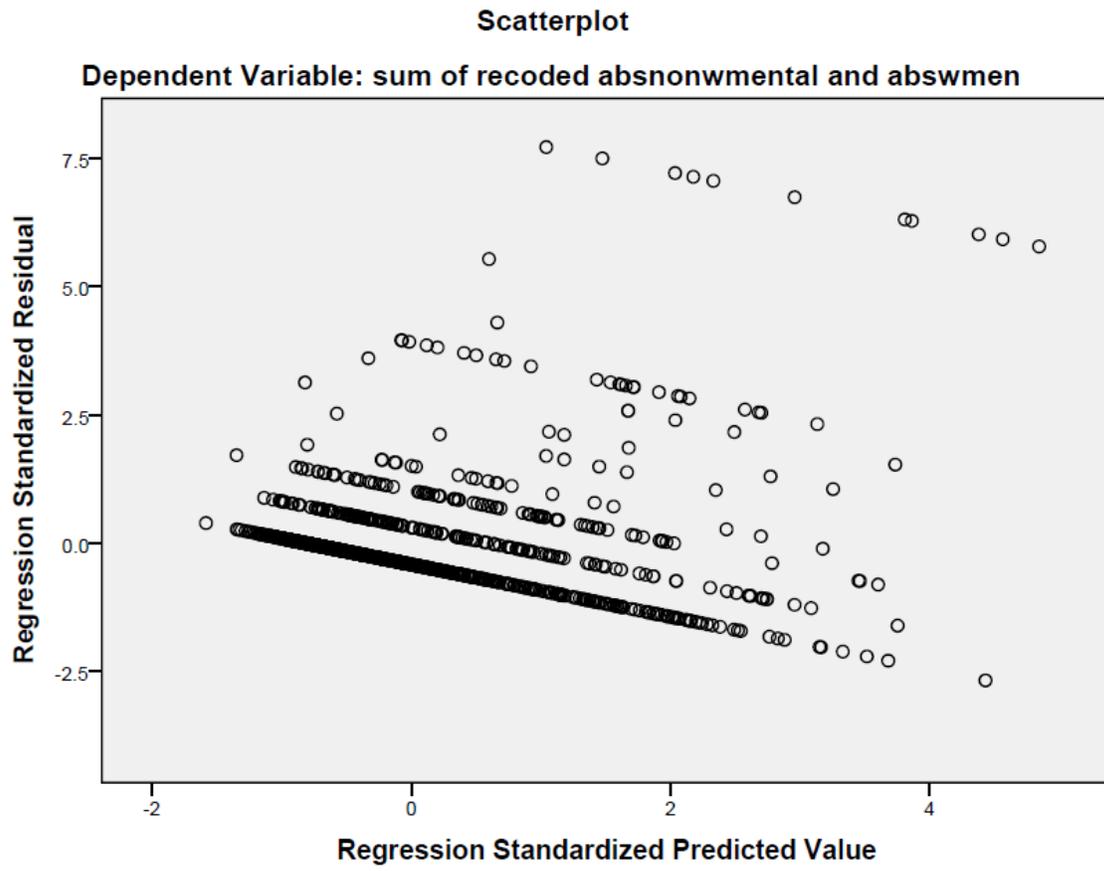


Figure C2



Appendix D: Physical Health-Related Absenteeism Residual Outputs

Table D1

Residuals Statistics ^a					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.84	20.10	4.21	2.015	1324
Residual	-15.564	33.529	.000	5.744	1324
Std. Predicted Value	-1.670	7.890	.000	1.000	1324
Std. Residual	-2.696	5.807	.000	.995	1324

a. Dependent Variable: sum of recoded absnonwphys and abswphys

Figure D1

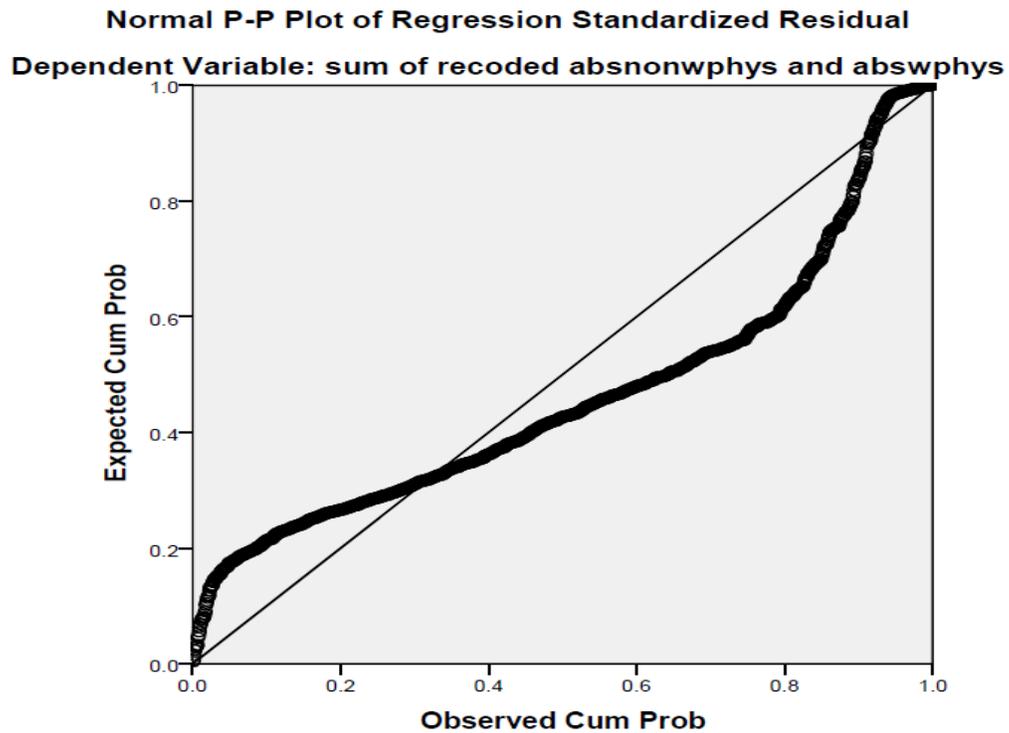
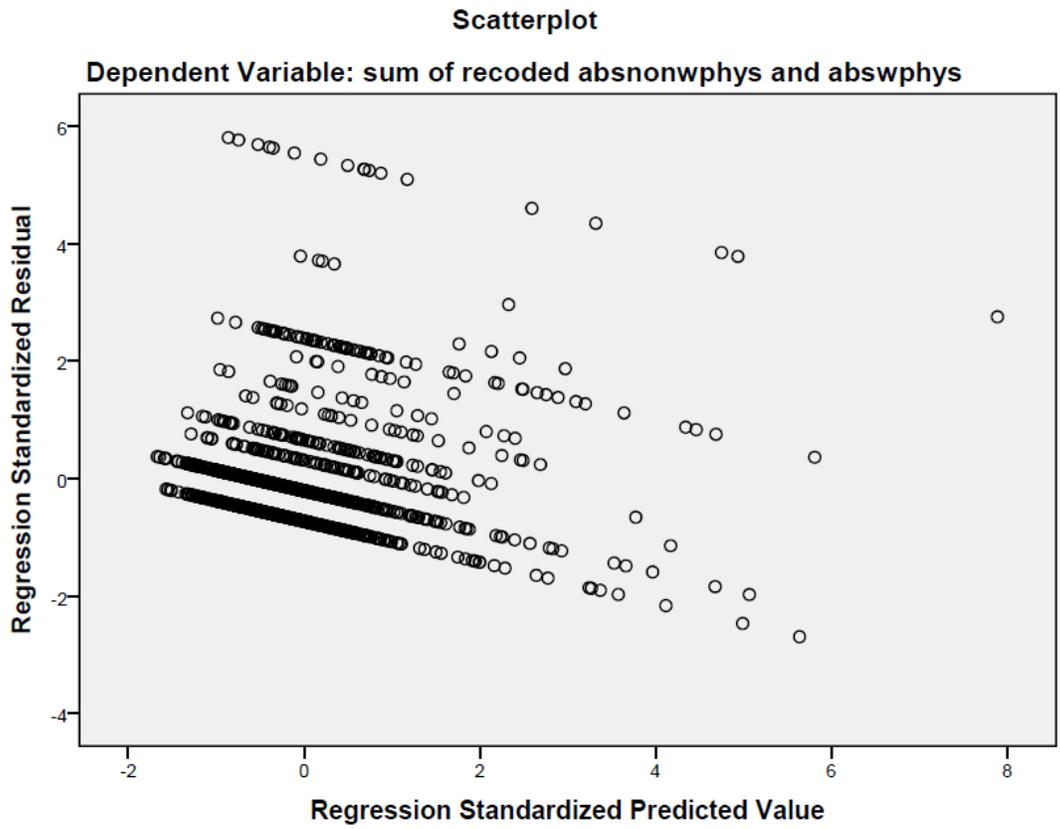


Figure D2



Appendix E: Total Absenteeism Residual Outputs

Table E1

Residuals Statistics ^a					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.0162	25.9890	6.0000	3.46150	1286
Residual	-19.98901	58.86533	.00000	7.78031	1286
Std. Predicted Value	-1.440	5.775	.000	1.000	1286
Std. Residual	-2.550	7.510	.000	.993	1286

a. Dependent Variable: Total_absenteeism

Figure E1

Charts

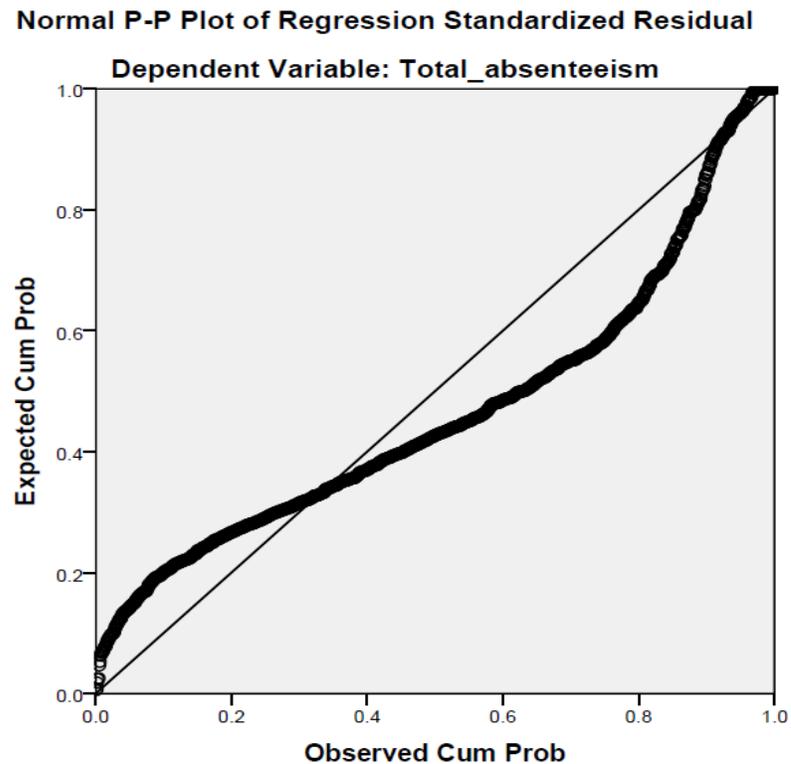
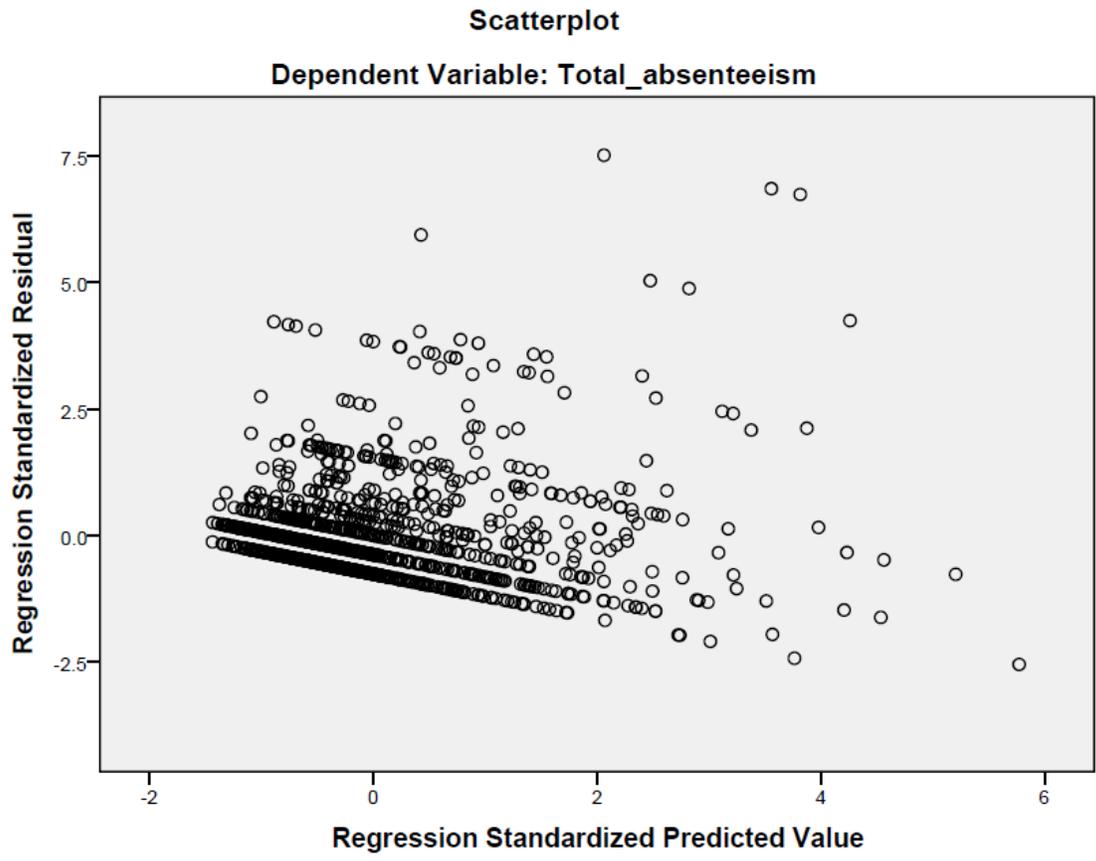


Figure E2



Appendix F: Presenteeism Residual Outputs

Table F1

Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.4878	1.7377	.9137	.19290	1178
Residual	-1.08333	1.71972	.00000	.40779	1178
Std. Predicted Value	-2.208	4.271	.000	1.000	1178
Std. Residual	-2.641	4.192	.000	.994	1178

a. Dependent Variable: Log_total_presenteeism

Figure F1

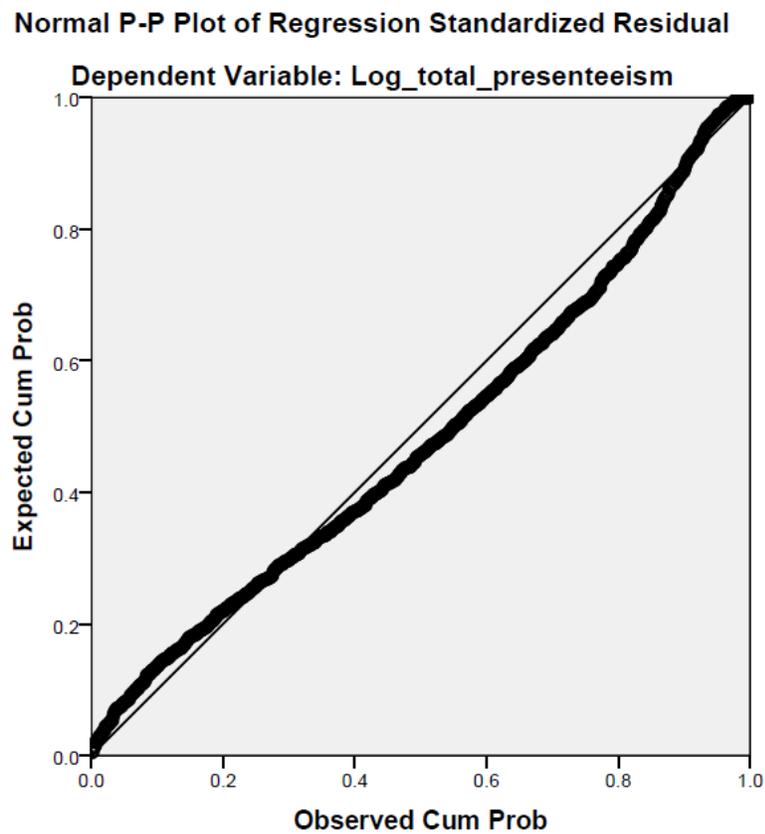
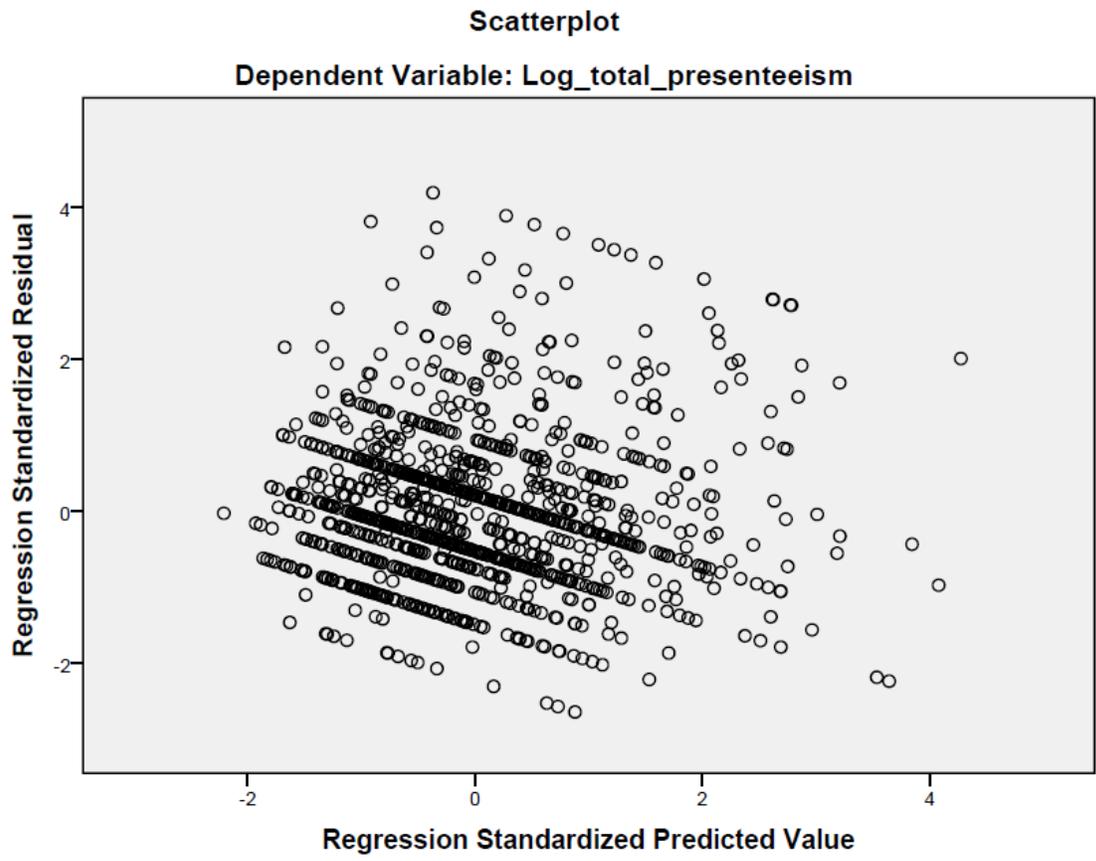


Figure F2

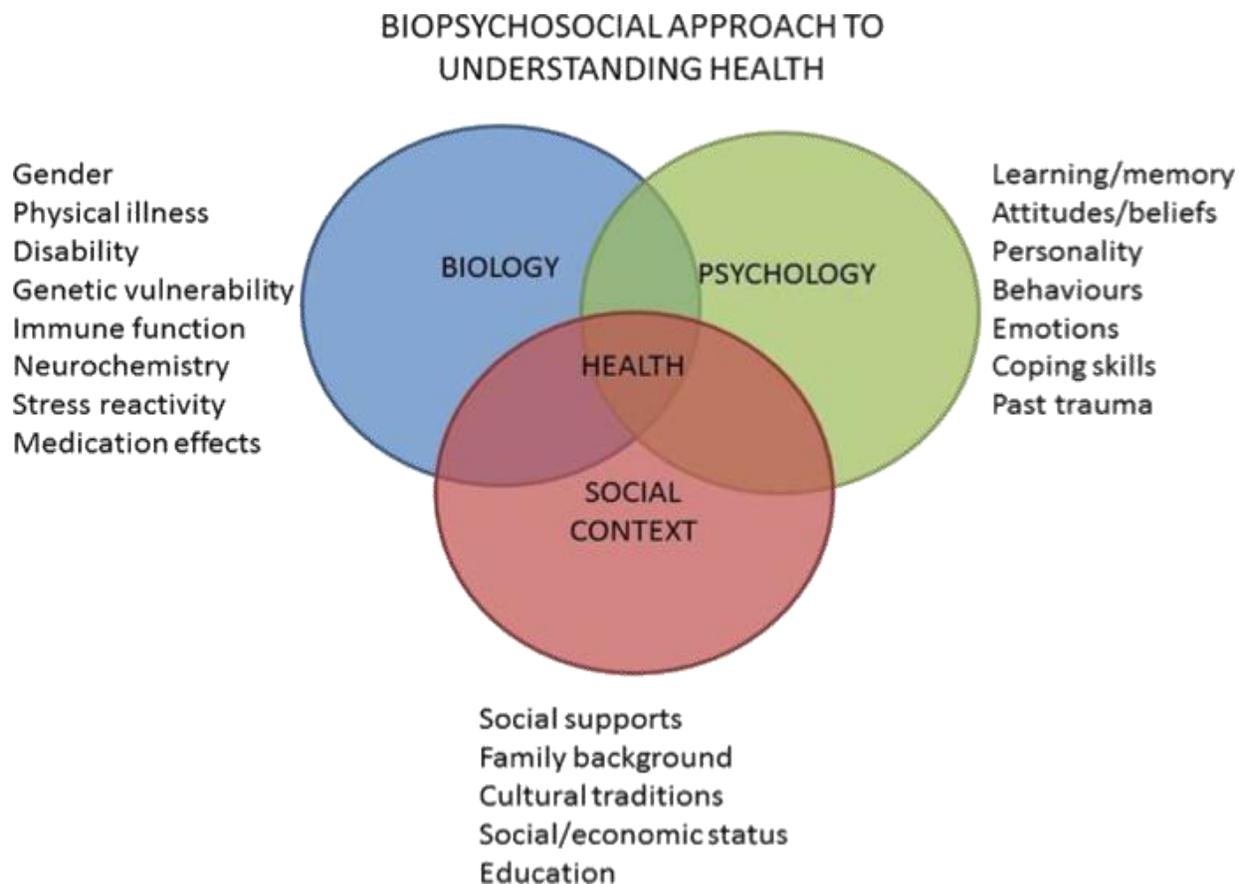


Appendix G - Situating Myself

The purpose of this section is to briefly position myself within my research. As a graduate student, it is important for me to take a reflexive approach and acknowledge how my previous experiences could influence my interpretations, understanding and beliefs throughout the research process. I am a white, heterosexual male who comes from a middle-class family in the predominately white, small town of Smiths Falls, Ontario. My mother was a nurse and my father served in the Canadian Special Forces. My personality is highly competitive, I have a strong passion for sport/exercise, and I am interested in psychology. My research is in occupational health psychology and identifying predictors of decreased work productivity in a Northern Ontario mining population. Growing up, I saw firsthand how stress and other indicators of poor mental health can impact absenteeism, along with how physical activity can reduce these rates. Both of my parents worked stressful vocations. My father exercised frequently and rarely missed work. My mother exercised infrequently and turned to less productive coping strategies, resulting in her missing work at a higher rate. Additionally, I personally exercise with regularity and work as a personal trainer. These childhood experiences and my current work position have contributed to the formulation of my belief in the mental health benefits of physical activity. This has likely influenced my hypothesis that higher rates of physical activity will be correlated with lower rates of work productivity. Furthermore, my background has helped to shape my interest in looking at a mining population. Mining is a high stress job and I have had the opportunity to see what working in a high stress environment can do. My father and my brother both worked in the military, so I have been able to see firsthand how vocational stress can impact the individual working in addition to the psychological toll it can take on their family. Further, prior to becoming involved with this project, an old roommate of mine who used to work in the mining

industry committed suicide after refusing to seek out help while he was struggling. This tragedy further ignited my interest in researching high stress working environments, particularly in male-dominated industries where mental health stigma is common.

Appendix E: The Biopsychosocial Model of Health



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