

The Influence of Psychological Comorbidity on Return-to-Work Following a Multidisciplinary

Rehabilitation Program

by

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Abstract

Background: Posttraumatic Stress Injury (PTSI) encompasses a range of trauma, mood, anxiety, and somatoform disorders. PTSI have been shown to have adverse effects on both physical and psychological health. Workers with PTSI demonstrate decreased work performance, functional capability, and ability to return-to-work (RTW). Comorbid injuries such as co-occurring physical and psychological conditions often exacerbate these adverse effects. However, the impact of psychological comorbidity (i.e., PTSI in conjunction with another mental health diagnosis like depression or anxiety) on RTW outcomes has not been examined.

Objectives: The current study aimed to 1) describe workers with comorbid psychological diagnoses compared to those with only a trauma-related psychological diagnosis, and 2) examine whether comorbid psychological diagnoses are associated with RTW in workers with PTSI.

Methods: We conducted a population-based cohort study using data from injured workers with PTSI admitted to the Workers' Compensation Board of Alberta's Traumatic Psychological Injury Program. Demographic, administrative, and psychological variables were obtained to examine differences between those with and without comorbid psychological diagnoses. Comorbid psychological diagnoses were defined as having multiple psychological diagnoses identified in the Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5; $n=146$) rather than only one diagnosis ($n=627$). We also obtained data on RTW status at discharge from rehabilitation. The psychological comorbidity variable was entered into a multivariable logistic regression model predicting RTW using a risk-factor modelling strategy. A p -value of 0.05 was used to establish significance.

Results: Workers with psychological comorbidity were more likely to be employed as public safety personnel (42.5% versus 31.6%, $p = 0.05$), had a longer duration between accident and

program admission (155.5 versus 76.0 days, $p = 0.003$), increased substance abuse issues (30.1% versus 18.2%, $p < 0.001$), and elevated scores on psychological measures of depression, anxiety, and posttraumatic stress. Psychological comorbidities identified were primarily trauma and comorbid depression (59.6%), trauma and multiple comorbid psychological diagnoses (17.1%), and trauma and comorbid anxiety (13.0%). The final logistic regression model indicated higher odds of RTW if workers had a single psychological diagnosis (OR 2.05, 95% CI 1.28 - 3.29, $p = 0.003$). Other variables remaining in the final model indicating higher odds of RTW included initially having a physical International Classification of Diseases, ninth revision (ICD-9) diagnosis (OR 1.90, 95% CI 1.13 – 3.19, $p = 0.02$), non-elevated scores on the Trauma Symptom Inventory-2 (TSI-2) trauma factor (OR 1.71, 95% CI 0.92 - 2.29, $p = 0.01$), and a higher readiness to RTW (OR 1.23, 95% CI 1.16 – 2.51, $p < 0.001$). Finally, RTW odds were lower for individuals working in education, law and social, community, and government (OR 0.54, 95% CI 0.34 – 0.85, $p = 0.01$), which included public safety personnel.

Conclusions: In workers with PTSI, being diagnosed with more than one psychological disorder appears to be associated with worse RTW outcomes following rehabilitation. Future research with larger samples is needed to identify if some diagnostic combinations impair return-to-work more than others.

Preface

This thesis is an original work by Brandon Krebs. The research project, which this thesis is a part of received research ethics approval from the University of Alberta Research Ethics Board, The Influence of Psychological Comorbidity on Return-to-Work (Pro00117127), January 20th, 2022.

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List of Abbreviations

BAI	Beck Anxiety Inventory
BDI	Beck Depression Inventory
FTW	Fit-to-Work
GAD	Generalized Anxiety Disorder
ICD-9	International Classification of Diseases 9 th Edition
MDD	Major Depressive Disorder
PSP	Public Safety Personnel
PTSD	Posttraumatic Stress Disorder
PTSI	Posttraumatic Stress Inventory
RTW	Return-to-Work
SF-36	36-item Short Form Health Survey
TSI-2	Traumatic Symptom Inventory-2
WCB-Alberta	Workers' Compensation Board of Alberta

Chapter 1: Introduction

1.1. Posttraumatic Stress Injuries

Research has demonstrated that following exposure to a traumatic event, psychological symptoms classified as posttraumatic stress injury (PTSI) commonly arise (Anderson et al., 2020; Baranyi et al., 2010; Breslau, 2009; Di Nota et al., 2021; Keynan & Keynan, 2016; Rose, 2006). These PTSI encompass a range of trauma, mood, anxiety, and somatoform disorders that are characterized by symptoms such as decreased social functioning, intrusive memories, hypervigilance, avoidance, worry, and diminished functional ability (Baranyi et al., 2010; Bryant et al., 2018; Brenes, 2007). Furthermore, PTSI often leads to physical and psychological role limitations, chronic physical health conditions (i.e., heart disease, asthma, ulcers, arthritis and back pain), and decreased ratings of quality of life and general health (Atwoli et al., 2015; Keyes et al., 2013; Zayfert et al., 2002). It is also important to emphasize that although PTSI are often associated with psychological diagnoses such as Posttraumatic Stress Disorder (PTSD), they also include partial, full or comorbid diagnoses of other psychological disorders (e.g., Major Depressive Disorder, Generalized Anxiety Disorder, Substance-Use Disorders, Panic Disorder etc.).

Psychologically traumatic events that give rise to PTSI, such as exposure to violence, natural disasters, or life-threatening injuries, are predicted to occur in roughly 50-80% of individuals at some point in their lives (De Vries & Olf, 2009; White et al., 2015). Further, following exposure to traumatic events, roughly 15% to 30% of individuals will develop symptoms consistent with PTSI (Bryant et al., 2010; Creamer et al., 2005). As such, it is no surprise that PTSI impact a significant proportion of the general population (Baranyi et al., 2010; Breslau, 2009; White et al., 2015). In fact, predicted global lifetime prevalence rates of PTSI

range from 1.3% to 41.0%, depending on the country and population examined (Van Ameringen et al., 2008; Oakley et al., 2021).

1.2. Neurobiological Underpinnings of Traumatic Stress

Beyond the high prevalence rates and adverse consequences associated with PTSD, psychological trauma has been found to result in long-term impacts on endocrine pathways and brain regions associated with regulating the fear and stress responses (Sherin & Nemeroff, 2011). One neurobiological pathway that psychological trauma has been suggested to influence is the hypothalamic-pituitary-adrenal (HPA) axis (Sherin & Nemeroff, 2011). The HPA axis is comprised of key endocrine pathways such as the anterior pituitary, adrenal glands, and hypothalamus, which together play a critical role in regulating cortisol levels in the body (Dunlop & Wong, 2019; Sherin & Nemeroff, 2011). Under normal circumstances, the HPA axis signals to increase cortisol levels in the blood during times of stress, which initiates the body's fight or flight response (Lehrner et al., 2016; Sherin & Nemeroff, 2011). However, following a PTSD such as PTSD, it is common for HPA axis dysfunction to occur, resulting in irregular blood cortisol levels and a subsequent inability to control the body's stress response (Lehrner et al., 2016). The inability to control the body's stress response is suggested to intensify common PTSD symptoms such as an exaggerated startle response, sleep disturbances, hypervigilance, and mood abnormalities (Dunlop & Wong, 2019; Lehrner et al., 2016).

In addition to the impact of PTSD on the HPA axis, PTSD has been found to lead to long-term changes to brain regions that are critical in the stress response, such as the amygdala, hippocampus, and prefrontal cortex (Bremner, 2006). For example, animal trials and MRI imaging studies in humans have demonstrated that frequent exposure to traumatic stress can cause tangible neurobiological changes such as decreased neuron density in the hippocampus and

prefrontal cortex, a chronic decrease in neural activity in the hippocampus and prefrontal cortex, and an increase in neural activity in the amygdala (Bremner, 2006; Sherin & Nemeroff, 2011). These neurobiological changes are linked to altered emotional processing, decreased control of the stress response, inhibited declarative memory, and increased overall severity of PTSD symptoms (Sherin & Nemeroff, 2011). Overall, the high prevalence rates, adverse symptoms, and long-term neurobiological impacts associated with PTSI make them a critical area of inquiry in various settings.

1.3. Posttraumatic Stress Injury's in the Workplace

One common setting for psychological injuries to occur is the workplace (Ghisi et al., 2013; Harvey et al., 2009; Joyce et al., 2016)). The Mental Health Commission of Canada (MHCC) reports that roughly 30% of all long-term workplace disability claims are related to psychological injuries, making them one of Canada's most common causes of workplace disability (2019). Consistent with this, mental health disorders are considered among the largest contributors to disability and extended time off work in most developed countries (Harvey et al., 2009; Joyce et al., 2016). Further, scientific literature indicates that PTSI are one of the most common psychological injuries reported in occupational settings (Wise & Beck, 2015). In fact, PTSI in the workplace can arise following a wide range of events such as physical injuries, occupational stress, exposure to traumatic events, assault and harassment (Buselli et al., 2020; Ellrich & Baier, 2017; Jankovic et al., 2021; Petereit-Haack et al., 2020). Overall, the prevalence of PTSI in the workplace makes them a critical area of interest for research examining treatment and RTW in a workers' compensation setting.

Beyond the high prevalence rates of occupational PTSI, they are also associated with numerous adverse consequences on psychological health, well-being, and workplace functioning

(Matthews & Chinnery, 2005; Rose, 2006; Skogstad et al., 2013). For example, one study examined return-to-work (RTW) outcomes in individuals with and without symptoms consistent with PTSI following a vehicular accident (Matthews et al., 2001). They found that individuals with PTSI reported worse RTW outcomes as well as higher ratings of disability related to depression, anxiety and pain at a two-year follow-up period (Matthews et al., 2001). Consistent with this, other research has reported that increased symptoms of PTSD and depression are associated with negative RTW rates (Lin et al., 2016). Moreover, occupational PTSI have also been found to result in decreased ratings of physical and mental well-being, quality of life, and social functioning (Ghisi et al., 2013; Koohsari et al., 2021; Lee et al., 2020; Van Der Klauw et al., 2016). The adverse mental and physical health symptoms experienced by individuals with PTSI are also associated with high rates of absenteeism and extended time off work, which results in high economic costs (Wilson et al., 2016).

Although there are similarities in the adverse effects of PTSI among individuals injured in or out of the workplace, research indicates that individuals experiencing work-related PTSI often report exacerbated psychological symptoms compared to individuals reporting PTSI in other settings (Mason et al., 2002). For example, a prospective cohort study compared psychological, physical, and social measures of health and well-being among individuals admitted to the hospital emergency room for work-related and non-work-related accidents (Mason et al., 2002). They found that although workplace accidents led to less severe physical injuries, they actually resulted in more severe psychological trauma symptoms and a more significant adverse impact on psychological well-being (Mason et al., 2002). This is significant as it indicates that the harmful effects of traumatic accidents on mental health are exacerbated in occupational settings. Overall, the literature suggests that PTSI are a prevalent issue in

occupational settings, with harmful economic impacts and long-term adverse effects on psychological health and well-being.

1.4. Posttraumatic Stress Injury and Co-Occurring Physical Injuries

Following exposure to psychologically traumatic events, it is common for co-occurring conditions to arise. These co-occurring conditions can intensify symptoms of PTSI and negatively impact the effectiveness of treatment interventions (Beckham et al., 1997; Giummarra et al., 2017; Hoge et al., 2007). One type of comorbidity that has received empirical attention is the co-occurrence of physical and psychological injuries following traumatic events (Duckworth & Iezzi, 2010; Giummarra et al., 2017; Tortella-Feliu et al., 2019; Wiseman et al., 2012). The co-occurrence of physical and psychological health conditions is significant as they are associated with a range of adverse outcomes such as increased rates of pain-related disability, general health ailments, depression, anxiety, psychological distress and functional limitations (Beckham et al., 1997; Giummarra et al., 2017; Hoge et al., 2007; Lerman et al., 2015). Furthermore, in occupational settings, the co-occurrence of physical and psychological injuries negatively impacts RTW rates, occupational functioning, and productivity (Beckham et al., 1997; Hensel et al., 2011; Herrera-Escobar et al., 2018; Hoge et al., 2007; Kessler et al., 2000). For example, a study by Van Der Vlegel and colleagues (2022) examined 3060 individuals admitted to one of 14 hospital emergency departments with physical injuries. They found that 22% of individuals also presented with symptoms of a mental health ailment such as depression, anxiety or PTSD. Further, they reported that those with co-occurring mental health ailments were less likely to RTW and presented lower quality of life ratings than individuals with solely a physical injury (Van Der Vlegel et al., 2022). Overall, the adverse effects of comorbid physical and

psychological conditions call into question how other comorbidities may affect individuals suffering from PTSI.

1.5. Psychological Comorbidity

Comorbid psychological conditions are one form of comorbidity that has received little empirical attention in an RTW context. Psychological comorbidity refers to the co-occurrence of two or more psychological diagnoses (e.g., PTSD and Major Depressive Disorder; PTSD and Substance use disorder, etc.). Psychological comorbidity is especially relevant for individuals with PTSI, as individuals with PTSI present symptoms from a range of different psychological diagnoses. Further, previous research indicates that the rates of psychological comorbidity are notably high following traumatic events, especially in individuals diagnosed with trauma-related psychopathologies (Meewisse et al., 2011; Flory & Yehuda, 2015). For example, DSM-5 diagnoses such as PTSD have been found to commonly co-occur with a range of other psychological diagnoses, including Substance use Disorder, Major Depressive Disorder (MDD), Generalized Anxiety Disorder (GAD) and Bipolar Personality Disorder (Beck et al., 2015; Cerimele et al., 2017; Flory & Yehuda, 2015; McCauley et al., 2012; Petereit-Hack et al., 2020). As such, many individuals suffering from PTSI following a psychologically traumatic event likely have symptoms consistent with multiple psychological diagnoses.

1.5.1. Models of Psychological Comorbidity

Understanding the etiology and treatment of co-occurring psychological conditions is a complex process that extends beyond examining each diagnosis individually. To understand how psychological comorbidity arises and subsequently impacts psychological health and well-being, examining models that aim to explain this complex relationship is necessary. Two prominent

models used to explain co-occurring psychological conditions are the Latent Variable and Network Models of Psychological Comorbidity (Eaton, 2015).

1.5.2. The Latent Variable Model of Psychological Comorbidity

The primary notion behind the Latent Variable Model of Psychological Comorbidity is that psychological diagnoses are explained by the presence of latent (undetected) factors (Eaton, 2015). These latent factors can include broad variables such as stress or social isolation. To explain the presence of a psychological diagnosis, this model suggests that an individual possesses elevations in these latent factors, which are highly associated with the development of a psychological diagnosis (Eaton, 2015). Further, to explain psychological comorbidity, this model suggests that these underlying latent variables associated with a psychological diagnosis are also highly associated with other psychological diagnoses (Eaton, 2015). Meaning that if a latent variable, such as stress, which gives rise to one psychological diagnosis, is present, the individual is at an increased risk of developing other psychopathologies as well (Eaton, 2015). For example, this model suggests that diagnoses such as MDD and GAD share latent factors that are highly associated with the development of both these diagnoses (Eaton, 2015). As such, if you meet the diagnostic criteria for MDD, you are at an increased risk of meeting the criteria for GAD as well.

1.5.3. The Network Model of Psychological Comorbidity

Another model that has been recently explored as an explanation for psychological comorbidity is the Network Model (Eaton, 2015). The central idea of the Network Model of Psychological Comorbidity is that underlying a psychological diagnosis is a set of interrelated symptoms (Cramer et al., 2010; Eaton, 2015). This set of symptoms is explained as a network of causal relationships where the occurrence of one symptom gives rise to related symptoms. To

explain the development of a psychological disorder, this model proposes that a symptom gives rise to other highly correlated symptoms, resulting in a collection of symptoms, which we label a psychological diagnosis (Cramer et al., 2010; Eaton, 2015). To explain comorbidity, this model asserts that some symptoms do not distinctly fit in one cluster of symptoms and act as a bridge between psychological diagnoses. These bridging symptoms are present in several different psychological disorders and subsequently give rise to symptoms in various symptom clusters, resulting in multiple psychological diagnoses (Cramer et al., 2010; Eaton, 2015). For example, sleep disturbances and fatigue are symptoms that are present in both GAD and MDD. Therefore, these are seen as overlapping symptoms that can subsequently give rise to symptoms of both psychological disorders, leading to two distinct diagnoses (Cramer et al., 2010; Eaton, 2015).

1.5.4. Impact of Psychological Comorbidity

Co-occurring psychological diagnoses are associated with numerous adverse effects on physical, social, and psychological well-being (Campbell et al., 2007; Roberts et al., 2015). For example, one study by Post and colleagues (2011) compared psychological symptom severity in individuals with PTSD and individuals with co-occurring PTSD and MDD. They found that independent of PTSD severity, individuals with co-occurring MDD had elevated negative affect, lower levels of positive affect, experienced increased flashbacks, and elevated dysphoria (Post et al., 2011). Furthermore, research examining PTSD and comorbid psychopathologies has also found that comorbidity is associated with increased psychological distress, social impairment, strain in interpersonal relationships, lower quality of life, more severe clinical symptoms, lower general functioning and higher rates of suicide (Ammerman et al., 2012; Beck et al., 2009; Panagioti et al., 2012; Pittman et al., 2012; Raab et al., 2015; Roberts et al., 2015). Beyond this, individuals with PTSD and a comorbid psychological diagnosis from workplace trauma report

increased medical costs, disability, and impaired occupational functioning (Merikangas et al., 2007; Wise & Beck, 2015).

Co-occurring psychological diagnoses have also been suggested to be challenging to treat, cause increased treatment attrition and lead to poor long-term mental health prognosis (Green et al., 2006; Nixon & Nearn, 2011; Rosen et al., 2020). For example, one study examining the impact of comorbid depression on 72 youth with primary anxiety-related diagnoses found that increased symptoms of comorbid depression were associated with poor treatment outcomes and a less significant reduction in measures of anxiety (O'Neil & Kendall, 2012). It has also been noted that limited research has examined the effectiveness of treatments to specifically target both PTSD and comorbid psychological conditions (Angelakis & Nixon, 2015). Therefore, it is suggested that different treatment approaches should be explored to fully address the symptoms of PTSD and co-occurring psychological diagnoses (Angelakis & Nixon, 2015; Rosen et al., 2020). Furthermore, research examining the treatment of comorbid conditions in workers' compensation settings primarily focuses on a psychological diagnosis and a comorbid physical condition and, to the author's knowledge, fails to address RTW in individuals with comorbid psychological diagnoses. As such, examining the effectiveness of an RTW intervention for individuals with comorbid psychological conditions is a crucial area of research that addresses gaps in the literature.

1.6. Multidisciplinary Treatment Interventions

Previous research suggests that symptoms resulting from psychological trauma are also difficult to treat and persistent over time (Bryant, 2018; Galatzer-Levy et al., 2013; Morina et al., 2014; Van Der Velden, 2013). One reason why psychological symptoms resulting from traumatic events could be so challenging to treat is that they present numerous barriers that

inhibit effective recovery (Stecker et al., 2013). For example, traumatic events that give rise to psychological symptoms can be difficult to disclose to others due to a fear of stigmatization and judgement (Stecker et al., 2013). Further, treatments following psychological trauma commonly involve discussing and, in some cases reliving the traumatic experience, which requires a high emotional readiness for treatment (Stecker et al., 2013). Further, based on research indicating that the treatment success of individuals with comorbid psychological diagnoses is relatively poor, it is likely that RTW rates are also low among these workers (Laudet et al., 2000; Armenta et al., 2019). As such, psychotherapeutic interventions administered alone- may not be the optimal approach to facilitate RTW in individuals with co-occurring psychological diagnoses following a psychologically traumatic event (Arends et al., 2012). Due to this, exploring alternative treatment approaches is especially relevant in this population. One alternative treatment approach suggested to be effective at treating psychological injuries in occupational contexts is multidisciplinary treatment programs that target numerous aspects relevant to a claimant's recovery (Mikkelsen & Rosholm, 2018).

Multidisciplinary treatment programs typically engage a range of health care providers such as psychologists, physicians, physiotherapists, social workers, and occupational therapists (Hoefsmit et al., 2012; Stammel et al., 2017, Vreeland, 2007). Together this network of service providers aims to address worker needs over three broad domains: health-focused, service coordination, and worker modification-focused intervention components (Cullen et al., 2018). The use of multidisciplinary treatment orientations in occupational PTSI is particularly relevant as physical, social, and psychological barriers typically exist that hinder the treatment process (Hoefsmit et al., 2012; Mikkelsen & Rosholm, 2018). For example, in cases of work-related PTSI, an occupational therapist might aim to overcome barriers inhibiting the patient's

functioning in daily life activities, including work-related activities. Further, in cases of PTSI, it is also common for physical injuries to be present (Duckworth & Iezzi, 2010; Giummarra et al., 2017). As such, on a multidisciplinary team, a Physiotherapist may focus on restoring movement and overcoming barriers related to physical functioning following a bodily injury. Overall, by providing a multidisciplinary treatment where numerous aspects of a client's condition are addressed, barriers that typically prevent treatment success are easier to overcome than in unidirectional treatment approaches such as psychotherapeutic interventions administered alone (Hoefsmits et al., 2012).

Furthermore, previous research has demonstrated that multidisciplinary treatment programs effectively promote rehabilitation and subsequent RTW following mental health-related occupational injury (Berglund et al., 2018; Cullen et al., 2018). For example, a randomized control trial examined a multidisciplinary therapeutic approach to promote RTW in participants with mental illness and co-occurring chronic pain conditions (Berglund et al., 2018). Participants received multidisciplinary treatment from a psychologist, a physician, an occupational therapist and a social worker or a treatment as usual control condition (Berglund et al., 2018). They found that at a 12-month follow-up, the multidisciplinary treatment was more effective at promoting RTW than the control condition. Further, the multidisciplinary treatment was even found to facilitate RTW in individuals on long-term sick leave, a population regarded as particularly difficult to treat (Berglund et al., 2018). Although multidisciplinary treatment programs have effectively overcome barriers and treated individuals with co-occurring physical and psychological conditions, research has not adequately examined the use of multidisciplinary treatment programs for comorbid psychological diagnoses. This is a critical gap in the literature as individuals with comorbid psychological conditions also present numerous barriers to

recovery, and a multidisciplinary treatment program may provide positive RTW outcomes for individuals in this population.

1.7. Factors Associated with Recovery and Return-to-Work

Previous research has examined demographic, administrative and psychological factors associated with positive RTW outcomes following treatment for traumatic occupational injuries. For example, a retrospective cohort study by Gabbe and colleagues (2016) examined risk factors indicative of a failure to RTW in a large sample of 8844 adult trauma survivors admitted to the hospital following physical injury. They found that old age, pre-existing medical conditions, low socioeconomic status, and employment in labourer occupations were correlated with significantly lower RTW rates following a traumatic injury (Gabbe et al., 2016). Moreover, a systematic review by Cancelliere and colleagues (2016) found that protective factors such as competitive pay, high socioeconomic status, high level of education, optimistic expectations for treatment, and the implementation of a multidisciplinary treatment program were all predictive of successful RTW following occupational injury. Identifying such factors is beneficial as they can be used to assess patients' risk of failure to RTW, triage them into different levels of care, and identify areas for interventions to target further. Although factors associated with RTW following psychologically traumatic events have been identified, to the author's knowledge, previous research has not examined co-occurring psychological diagnoses as a risk factor for RTW outcomes following occupational PTSD.

1.8. Literature Synthesis

Posttraumatic stress injuries are a common form of workplace accident associated with a host of adverse effects (Ghisi et al., 2013; Lee et al., 2020; Mason et al., 2002; MHCC, 2019; Rose, 2006; White et al., 2015). However, previous research examining RTW outcomes

following psychological trauma in occupational settings has primarily focused on recovery from a trauma-related diagnosis such as PTSD and has largely ignored the influence of co-occurring psychological conditions (MacDonald et al., 2003; Plat et al., 2013; Stergiopoulos et al., 2011). Further, factors and characteristics present in individuals with comorbid psychological conditions following an occupational injury have not been adequately studied in an RTW context. This lack of empirical attention to comorbid psychological diagnoses is especially problematic as they are generally regarded as persistent, resistant to treatment, and characterized by high symptom severity (Campbell et al., 2007; Roberts et al., 2015). Therefore, research investigating factors present in individuals with comorbid psychological conditions and how psychological comorbidities impact RTW outcomes are novel areas of inquiry that need to be addressed to improve rehabilitation services and subsequent RTW outcomes in individuals suffering from PTSI.

1.9. Study Objectives and Research Questions

In the present study, we utilized demographic, administrative and psychometric data provided by the Workers' Compensation Board of Alberta (WCB-Alberta) on all clients admitted into WCB-Alberta Traumatic Psychological Injury rehabilitation programs from January 2017 to August 2019 to answer the following research questions:

- 1) Do individuals suffering from PTSI diagnosed with singular versus comorbid psychological diagnoses differ in demographic, administrative and psychological variables at program intake?
- 2) Does the presence of comorbid psychological diagnoses in an individual suffering from PTSI influence RTW outcome at program discharge (i.e., are RTW outcomes different

between individuals with just a PTSD diagnosis compared to someone with PTSD and a co-occurring MDD diagnosis)?

- i. Are RTW outcomes different among various types of psychological comorbidities (i.e., PTSD and comorbid MDD versus PTSD and comorbid GAD)?

1.9.1. Hypotheses

1. We hypothesize that there will be differences in demographic, administrative and psychological variables between those diagnosed with singular versus comorbid psychological diagnoses.
2. We hypothesize that individuals presenting with disorders from multiple DSM-5 diagnostic categories will have worse RTW outcomes following program discharge.
 - i. We do not have a specific hypothesis regarding how different types of psychological comorbidities will impact RTW outcomes.

Table 1

List of Demographic, Administrative and Psychological Variables Being Examined in the Current Study

Type of Variable	Variable
Demographic and Administrative Variables	Age
	Sex
	Education
	Occupation
	Primary Nature of Injury
	Type of Accident
	Primary ICD-9 Diagnosis (Physical/Psychological)
	Number of Treatment Days Absent
	Number of Previous Compensation Claims
	Length of Time (Injury to Admission)
	Program Length (Admission to Discharge)
	Anticipated Length of the program
	Current Work Status
	TPI Level Admitted to
	Legal Issues
	Claim Issues
Psychological Variables	Previous Psychological Trauma History

Suicide Risk

Current Substance Abuse

WCB-Alberta Psychological Log

Pain Intensity

Relaxation Skills

Energy

Sleep

Mood

Readiness

Beck's Depression Inventory (BDI-II)

Beck's Anxiety Inventory (BAI)

Trauma Symptom Inventory (TSI-2)

Short Form Health Survey (SF-36)

Chapter 2: Methods

2.1. Study Design

The Workers' Compensation Board of Alberta (WCB-Alberta) routinely collects data on various demographic, administrative, occupational, injury-related, and psychosocial variables at program intake and throughout their rehabilitation programs. The current study employed a population-based cohort design which used data collected from all individuals admitted into WCB-Alberta PTSI programs between January 2017 and August 2019. Archived data from the WCB-Alberta's administrative databases were supplemented by information extracted from WCB-Alberta claimant reports from the Posttraumatic Psychological Injury program. WCB-Alberta Health Care Analysts supervised the data extraction process. Due to COVID-19 considerations, supplementary data extraction was conducted through a remote connection to a desktop computer located at Millard Health Center. The data utilized in this study came from multiple WCB care providers within Alberta (CBI Health, Millard Health, Orion Health, and LifeMark Health).

2.2. The WCB-Alberta Posttraumatic Stress Injury Program

The Workers' Compensation Board of Alberta offers a PTSI program to address PTSI resulting from occupational accidents. This treatment program presents a multidisciplinary approach to rehabilitation, beginning with a screen administered by a registered psychologist that assesses workers on clinical factors inhibiting RTW (Rose, 2006). This screen is used to assign workers to one of three levels of treatment (Rose, 2006):

- TPI level 1 program: Consists of 1-2 appointments a week of psychotherapy with a registered psychologist.

- TPI level 2 program: Consists of psychotherapy with a registered psychologist 1-2 times a week and 1-2 meetings a week with an occupational therapist, targeting reintegration into society and the workforce.
- TPI level 3 program: Consists of multidisciplinary rehabilitation services such as individual psychotherapy, group therapy, physiotherapy for physical musculoskeletal injuries, and occupational therapy to target workplace reintegration. Treatment at this level is carried out 4 or more times a week for roughly 5 hours a day. This program is typically offered to workers suffering from both physical and psychological injuries.

The primary goal of the PTSI rehabilitation program is to facilitate RTW for individuals injured at their place of occupation (Rose, 2006). The PTSI program aims to achieve this by offering health-focused interventions through a network of physicians, physiotherapists, and psychologists. Together these health care professionals provide a comprehensive treatment which includes medical treatment, psychotherapy, and occupational therapy. An overview of the PTSI Care Model is provided in Appendix A, Figure 1, to provide an additional depiction of services offered through the program (Rose, 2006).

2.3. Participants

The merged database contains information on all the injured workers ($n=773$) admitted to the WCB-Alberta PTSI rehabilitation program between January 2017 and August 2019. The full sample was comprised of slightly more male workers (53.3%), with an average age of 42.1 ($SD=11.6$). The most common occupational categories workers were employed in include trades (29.0%) and community government service (24.8%) occupations. The primary types of accidents in the full sample include exposure to harm (35.6%) and assault and violence-related

(26.5%) injuries. The single psychological injury group was also comprised of slightly more males (52.3%), with an average age of 42.1 ($SD = 11.6$). The most common occupational categories workers of this group were employed in include trades (31.4%) and community government service (23.9%) occupations. The primary types of accidents individuals in the single psychological diagnosis group were involved in include exposure to harm (34.6%) and assault and violence-related (25.2%) injuries. Finally, individuals in the comorbid psychological diagnoses group were comprised of a majority of males (57.5%), with an average age of 42.0 ($SD = 11.3$). The most common occupational categories workers in this group were employed in include health care (23.3%) and community government service (28.8%) occupations. The primary types of accidents individuals in the comorbid psychological diagnoses group were involved in include exposure to harm (39.7%) and assault and violence-related (32.2%) injuries.

2.4. Data Collection

A database of archived administrative data provided by WCB-Alberta consisting of demographic, administrative and psychological variables was supplemented by information extracted from PTSI claimant reports provided by WCB-Alberta. Variables included in this database can be found in Table 1.

2.5. Measures

2.5.1. Psychological Diagnostic Categories

All claimants were assessed for psychological diagnosis during the screening and intake process into WCB-Alberta's TPI program using the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013). All individuals included in the PTSI program meet the criteria for a trauma-related psychological diagnosis; however, a subset also meets the diagnostic criteria for comorbid psychological diagnoses. Groupings of diagnoses

were determined based on the DSM-5 diagnostic categories. All diagnoses present in individuals admitted to the WCB-Alberta PTSI program are grouped under their diagnostic category and listed in Table 2. Individuals were further categorized based on the presence or absence of comorbid psychological diagnoses (see Table 3). Individuals from the comorbid psychological diagnoses group were then compared to individuals with only one psychological diagnosis to determine differences across demographic, administrative and psychological variables. Further, the RTW outcomes of individuals from the comorbid psychological diagnoses group were compared to the RTW outcomes of individuals with only one psychological diagnosis.

2.5.2. Descriptive (independent) variables

The dataset obtained from WCB-Alberta contained a range of demographic, administrative and psychological variables (see Table 1). Demographic variables such as gender and education level were collected through self-report measures administered by WCB-Alberta treatment providers at the time of program assessment, while other demographic and administrative variables (TPI level, accident type, occupation etc.) were collected from a WCB-Alberta administrative database. Furthermore, supplementary data (i.e., self-reported history of psychologically traumatic events, risk of suicide, and current substance misuse issues) and clinical measures of psychological variables (i.e., depression, anxiety, posttraumatic stress, and overall health and well-being) were extracted from detailed claimant assessment files administered at the time of the worker's admission to the PTSI program. The history of psychologically traumatic events, risk of suicide, and substance misuse variables were assessed and recorded through checkboxes and written descriptions, while psychological variables were measured through validated psychometric measures administered by the rehabilitation provider conducting the intake assessment (e.g., psychologist or occupational therapist).

Table 2*List of DSM-5 Diagnoses Present and Corresponding DSM-5 Diagnostic Categories*

DSM-5 Diagnostic Code:	DSM-5 Diagnosis
Trauma and Stressor-Related Disorders	
309.81	Posttraumatic Stress Disorder
309.89	Other Specified Trauma or Stressor-Related Disorder
309.24	Adjustment Disorder with Anxiety
309.9	Adjustment disorder Unspecified
309.4	Adjustment Disorder with Mixed Disturbance of Emotions and Conduct
309.28	Adjustment Disorder with Mixed Anxiety and Depressed Mood
309.0	Adjustment Disorder with depressed Mood
308.3	Acute Stress Disorder
308	Acute Reaction to Stress
Anxiety Disorders	
300.00	Unspecified Anxiety Disorder
300.01	Panic Disorder
300.02	Generalized Anxiety Disorder
300.09	Other specified Anxiety Disorder
Depressive Disorders	
296.22	Major Depressive Disorder-Single Episode-Moderate
296.32	Major Depressive Disorder-Recurrent Episodes-Moderate
296.33	Major Depressive Disorder-Recurrent Episodes-Severe
300.04	Persistent Depressive Disorder (Dysthymia)

311 Unspecified/Other Specified Depressive Disorder

Substance-Related Disorders and Addictive Disorders

305.2 Cannabis use Disorder-Mild

305.6 Stimulant use Disorder-Mild (Cocaine)

305.9 Other (or Unknown) Substance use Disorder-Mild

Personality Disorders

301.4 Obsessive-Compulsive Personality Disorder (Cluster C Personality Disorder)

301.83 Borderline Personality Disorder (Cluster B Personality Disorders)

Bipolar and Related Disorders

296.7 Bipolar Disorder 1: Current or Most Recent Episode Unspecified

Somatic Symptom and Related Disorders

300.11 Conversion Disorder

300.82 Somatic Symptom Disorder

Table 3*Breakdown of Groups (Single vs. Comorbid Diagnoses)*

Group One (n=627)
Trauma and Stress-Related Disorders only (n=627)
Group Two (n=146)
Comorbid Psychological Diagnoses
2.1. Trauma and Stress-Related Disorders and Comorbid Depressive Disorder (n=87)
2.2. Trauma and Stress-Related Disorders and Comorbid Anxiety Disorder (n=19)
2.3. Trauma and Stress-Related Disorders and Comorbid Personality Disorder (n=3)
2.4. Trauma and Stress-Related Disorders and Comorbid Substance Use Disorder (n=8)
2.5. Trauma and Stress-Related Disorders and Comorbid Somatoform Disorder (n=3)
2.6. Two or More Comorbid Psychological Diagnoses from any DSM-5 Categories (n=25)
2.7. Comorbid Diagnoses with No Trauma Diagnosis (n=1)

2.5.3. Return-to-Work Outcome

The primary outcome measure examined was the claimant's RTW/Fit to work (FTW) status at program discharge. Return-to-Work, in this study, is defined as the ability to return to the claimant's previous place of occupation, performing the same or modified tasks. The RTW rate is a common measure used in workers' compensation settings to measure the effectiveness of a rehabilitation program (Hamer et al., 2013; Hara et al., 2018; Lagerveld et al., 2012; Pachoud, 2010; Rose, 2006). This is because RTW status indicates functional ability in a real-world setting and suggests increased self-esteem, self-confidence and feelings of social unity (Cancelliere et al., 2016; Lagerveld et al., 2012; Pachoud, 2010).

2.5.4. WCB-Alberta's Psychology Log

The Psychology Log is a 7-item measure used by WCB-Alberta to assess workers on various psychological variables. The psychology log was administered to claimants at intake, discharge, and throughout the rehabilitation program. The Psychology Log is rated on a 0-10 numerical scale and assesses the claimant's current pain intensity, stress, energy, readiness to RTW, mood, the average number of hours they sleep each night, and their ability to apply relaxation skills. The Psychological Log is an internal WCB measure that has been found to be successful in predicting RTW outcomes in workers with PTSD (Gross et al., 2021).

2.5.5. Trauma Symptom Inventory-2

The Trauma Symptom Inventory-2 (TSI-2) is a 136-item self-report questionnaire that assesses symptoms of psychological trauma using a 0-3 Likert scale, with higher scores indicating a higher severity of trauma-related symptoms (Briere, 2011). The TSI-2 is scored according to four overarching factors and 12 clinical subscales (Briere, 2011). The general trauma factor scale contains the defensive avoidance, intrusive experiences, dissociation, and

anxious arousal subscales. The externalization factor scale includes the anger, tension reduction, sexual disturbance, and suicidality subscales. The self-disturbance factor scale contains the insecure attachment, depression, and impaired self-reference subscales. Finally, the somatization factor scale is comprised of only the somatic preoccupation subscale (Briere, 2011). Each clinical subscale is comprised of 10 items and is scored to produce categorical classifications of not clinically significant, problematic, and clinically elevated. For the current study, problematic and clinically elevated scores were grouped together, as both indicate the elevation of the subscale/factor. The measure contains two validity scales to detect false reporting, malingering, and random responding, which are scored to produce classifications of valid, atypical, and invalid (Briere, 2011). For the current study, results from the measure were removed if the validity scales produced a categorical rating of invalid. Data from the TSI-2 remained included in the database if the validity scales produced a rating of valid or atypical. Responses that produced a rating of atypical remained in the database because research has demonstrated that a score of atypical on the TSI-2 can commonly arise due to genuine response patterns indicative of psychological distress (Ales & Erdodi, 2022). The TSI-2 has demonstrated good factor validity and strong psychometric properties in clinical and research settings and has been successfully used in previous research to assess trauma symptomology in respondents during treatment and rehabilitation services (Every-Palmer et al., 2019; Filone & DeMatteo et al., 2017; Godbout et al., 2016; Nilsson et al., 2018; Willis et al., 2015).

2.5.6. Beck Depression Inventory-II (BDI-II)

The Beck Depression Inventory-II (BDI-II) is a 21-item self-report measure of clinical depression with high internal consistency, external validity and test-retest reliability in clinical and research settings in a variety of populations (Beck et al., 1996; El-Den et al., 2018; Garcia-

Batista et al., 2018; Segal et al., 2008; Smarr & Keefer, 2011; Song et al., 2012). Each item on the measure is rated on a 0 to 3 Likert scale producing a total score out of 63, which corresponds to one of four severity categories: 0 to 13 signifies minimal depression, 14 to 19 signifies mild depression, 20 to 28 signifies moderate depression, and 29 to 63 signifies severe depression (Beck et al., 1996). Due to the low frequency of minimal and mild severity ratings, the minimal and mild categories and the moderate and severe categories were grouped to create minimal/mild and moderate/severe categories for the BDI-II in the current study (Appendix B, Table 1). The BDI-II is a widely used measure that has been successfully applied in previous research to assess symptoms of depression in a variety of settings with various populations (Garcia-Batista et al., 2018; Iniesta et al., 2018; Nardone et al., 2021; Ready et al., 2012; Segal et al., 2008; Thornton et al., 2019).

2.5.7. Beck Anxiety Inventory

The Beck Anxiety Inventory (BAI) is a self-report anxiety measure with adequate to strong psychometric properties, including moderate-high ratings of internal consistency, inter-rater reliability and test-retest reliability in multiple populations (Bardhoshi et al., 2016; Beck et al., 1988; Julian, 2011; Khesht-Masjedi et al., 2015; Pang et al., 2019). The 21-items are rated individually on a 0-3 Likert scale, resulting in a total ranging from 0-63, with high scores indicating greater levels of anxiety-related symptomatology (Beck et al., 1988). The total scores correspond to one of four categories indicating varying severities: 0 to 7 suggests minimal anxiety, 8 to 15 suggests mild anxiety, 16 to 25 suggests moderate anxiety, and 26 to 63 suggests severe anxiety (Beck et al., 1988; Rector & Arnold, 2006). Due to the low frequency of minimal and mild severity ratings, the minimal and mild categories and the moderate and severe categories were grouped to create minimal/mild and moderate/severe categories for the BAI in

the current study (Appendix B, Table 1). Previous research has successfully used the BAI in a wide variety of clinical and research settings as a valid and reliable measure of anxiety in various populations (Bardhoshi et al., 2016; Lemos et al., 2019; Mazidi et al., 2016; Oh et al., 2018; Toledano-Toledano et al., 2020).

2.5.8. 36-item Short-Form Health Survey

The 36-item Short-Form Health Survey (SF-36) is a 36-item scale that is used to measure physical and psychological health and well-being across multiple domains (Ware & Sherbourne, 1992). The SF-36 possesses acceptable psychometric properties, including adequate internal reliability, structural validity, and convergent validity ratings administered across clinical and research settings in various populations (Hu et al., 2010; LoMartire et al., 2020; Salazar & Bernabe, 2012; Ten Klooster et al., 2013; White et al., 2017). The SF-36 measures items across eight health concepts: physical functioning, social functioning, physical role functioning, emotional role functioning, body pain, Vitality, general mental health and well-being, and self-perceived general health (Ware & Sherbourne, 1992). Individual sections are added up, resulting in a score ranging from 0 to 100, with lower scores indicating a higher degree of disability (Ware & Sherbourne, 1992). This measure has been successfully used in previous research examining treatment in multidisciplinary rehabilitation and workers' compensation settings (Bremander et al., 2010; Gross et al., 2015; Khan et al., 2012; Wu et al., 2021).

2.6. Procedures

Access to the WCB-Alberta database was granted as a part of a related study looking at RTW rehabilitation in first responder populations in individuals with co-occurring physical and psychological traumatic injuries. The current study used information extracted from the same database; however, it examined different variables of interest. Ethics approval was granted by the

University of Alberta Research Ethics Board (Pro00117127). Two trained researchers conducted data extraction and verification using a remote desktop connecting to Millard Health center, a WCB-Alberta rehabilitation facility. All data underwent a double data verification process where an alternative data collector verified 10% of claims collected. Variables from the supplementary data extraction were merged with data from the WCB-Alberta's administrative databases.

2.7. Data Cleaning

Many patient-reported outcome measures were not recorded consistently across claimant files. For example, psychological measures such as the BAI and BDI-II scores were recorded inconsistently across clinical sites, appearing as both categorical and continuous variables. As such, all BDI-II and BAI numeric scores were converted into their respective categorical scores (i.e., Minimal, Mild, Moderate, and Severe). Further, due to the low frequency of minimal and mild severity ratings, the minimal and mild categories and the moderate and severe categories were grouped to create minimal/mild and moderate/severe categories for both the BDI-2 and BAI. Similarly, the TSI-2 problematic and clinically elevated categories were grouped together and labelled as elevated for data analysis purposes. Further, if a factor scale or subscale score was not indicated on the claimant report in which the TSI-2 was indicated as administered, the factor/scale score was marked as non-elevated. Moreover, due to small sample sizes in certain occupational groups, the occupational category variable was collapsed into three groups for the logistic regression analysis: 1) trades, 2) education, law and social, community and government (including Public Safety Personnel (PSP)), and 3) other occupations (e.g., management, applied sciences, sales and services, manufacturing, business, finance, and administration, etc.). For the binary logistic regression model, RTW and FTW were grouped together and labelled as RTW after statistical analysis confirmed that the two groups did not differ on key variables (i.e.,

variables included in the final logistic regression model). Further, the grouping of RTW and FTW is justified theoretically as both outcomes indicate that an individual has recovered and is considered able to work.

2.7.1. Power and Sample Size Calculations

An a-priori power analysis was conducted for the logistic regression analysis to determine the required sample size for statistical significance. The power analysis was conducted using G*power, a free downloadable software used for power and sample size estimates (Faul et al., 2009).

The required sample size calculation was conducted for the logistic regression analysis to ensure an adequate sample size was obtained to establish statistical significance for research question two (i.e., is psychological comorbidity predictive of RTW status at program discharge). RTW status was the outcome measure, and the comorbid psychological diagnoses variable was the main predictor variable of interest. The proportion of individuals in the single diagnosis (59.0%) and comorbid diagnoses (33.6%) groups that were successful in their RTW were used to calculate an odds ratio of 2.84. For this analysis, the level of statistical significance was set to 0.05, with the desired power level of 0.80. The proportion of individuals with comorbid psychological diagnoses (0.19) was also entered into G*power. Based on these values, the minimum sample size needed to detect statistical significance is 197 participants. Therefore, our sample of 773 individuals should not limit our ability to detect statistically significant results.

2.8. Data Analysis

The merged database was initially cleaned and examined for missing data. To achieve our first objective, appropriate descriptive statistics were calculated for the full sample ($n=773$) as well as for the comorbid diagnoses group ($n=146$) and the single diagnosis group ($n=627$)

independently. This included n (%) for categorical variables or mean (SD) for continuous variables. Independent sample t -tests (for continuous variables) and Chi-squared tests of independence (for categorical variables) were used to identify significant differences between the two groups across the demographic/ administrative factors, the patient-reported outcome measures assessed at the time of admission (i.e., TSI-2, BDI-II, BAI, & SF-36), and RTW outcome at program discharge. Median values were displayed for continuous variables that violated the normality assumption, and non-parametric tests were used to compare medians. Finally, a subgroup analysis was conducted to determine if RTW outcomes differed across psychological comorbidity categories (i.e., comparing RTW rates between individuals with comorbid depression and comorbid anxiety disorders).

We conducted a multivariable logistic regression analysis predicting RTW to achieve our second objective. For the logistic regression model, RTW and FTW were grouped together and labelled as RTW. We used a risk-factor modelling strategy, with the psychological comorbidity variable always forced into the model (Hosmer et al., 2013). Initially, a univariate screen was conducted to identify statistically different variables between the groups (Hosmer et al., 2013). Variables at a significance level of $p < 0.05$ were selected for the multivariable logistic regression analysis. Variables not reaching a significance of $p < 0.10$ were removed from the regression model. However, BAI and history of trauma variables were added back into the final multivariable logistic model as they were approaching the statistical cut-off point of $0.10 < p > 0.15$, and the addition of these variables is supported theoretically (Breslau et al., 1999; Lin et al., 2013). Other critical demographic variables such as age and sex were forced into the final model. The relevant assumptions for logistical regression analyses (e.g., normality, collinearity, and linearity at the logit) were assessed and met.

The statistical analysis was conducted using IBM's Statistical Package for the Social Sciences (SPSSv28). All statistical analyses were conducted using the recommended p value for the significance of $p < 0.05$ (Tabachnik & Fidell, 2013).

2.8.1. Missing Data Analysis

A large proportion of individuals had incomplete data on the patient-reported psychological (i.e., BAI, BDI, TSI-2, and Psychology log) or demographic (i.e., Sex and Primary ICD-9 code) variables, with 211 (27.3%) workers missing at least one of these measures. Data was found not to be missing at random. Workers with missing data were more likely to RTW at treatment discharge (62.4% versus 51.2%, $p = 0.01$) and were less likely to initially have a psychological ICD-9 diagnosis (77.8% versus 84.3%, $p = 0.03$). Further, claimants with missing data were less likely to work as PSP (20.8% versus 38.1%, $p < 0.001$), less likely to have a history of trauma (57.8% versus 74.6%, $p < 0.001$), and less likely to have substance abuse issues (12.4% versus 25.4%, $p < 0.001$). Finally, individuals with missing data were more likely to have legal issues involved in their claim (13.4% versus 4.8%, $p = 0.01$) and reported a higher average pain intensity rating on the WCB-Alberta psychology log (4.30 ± 2.74 versus 3.59 ± 2.80) than individuals without missing data.

2.9. Ethical Considerations

The current study received ethical approval from the University of Alberta Research Ethics Board (Pro00117127). All identifying information, including the claimant identification numbers, was removed from the dataset. Individuals with access to WCB-Alberta files underwent a background check and were bound by a WCB confidentiality agreement to ensure identifying information of claimants was not exposed.

Chapter 3: Results

3.1. Characteristics of Workers With and Without Comorbid Psychological Diagnoses

The descriptive statistics on the full sample ($n=773$), single diagnosis ($n=627$) and comorbid psychological diagnoses groups ($n=146$) are provided in Table 4. A comparison of demographic and administrative variables indicated numerous differences between the comorbid and single psychological diagnoses groups (see Table 4). Individuals in the comorbid psychological diagnoses group were more likely to be employed as public safety personnel (42.5% versus 31.6%, $p = 0.05$). Further, fewer individuals in the comorbid psychological diagnoses group reported co-occurring physical injuries (26.7% versus 43.3%, $p < 0.001$). The median program length was significantly longer for individuals suffering from comorbid psychological conditions (113.0 days versus 91.0 days, $p < 0.001$). Finally, individuals in the comorbid psychological diagnoses group had a higher median number of days between the date of accident and program admission (155.5 versus 76.0 days, $p = 0.003$), reported a higher degree of substance abuse issues (30.1% versus 18.2%, $p < 0.001$), were more likely to have a history of trauma (76.7% versus 68.4%, $p < 0.001$) and were, on average, more likely to miss scheduled treatment days (7.4 versus 5.7 days, $p = 0.04$).

Table 4

Characteristics of Injured Workers Admitted to the Worker's Compensation Board of Alberta's Traumatic Psychological Injury Rehabilitation Programs Between the Years 2017-2019

Variable	Full Sample	Psychological Diagnosis Level		p-value (Two-tailed) t or χ^2
		Single Psychological Diagnosis	Comorbid Psychological Diagnoses	
		Mean \pm SD or n (%)	Mean \pm SD or n (%)	
Demographic/Administrative Variables	(n=773)	(n=627)	(n=146)	
Public Safety Personnel				0.05*
Yes	259 (33.5%)	199 (31.6%)	59 (42.5%)	
Police	35 (4.5%)	26 (13.1%)	9 (6.2%)	
Firefighter	20 (2.6%)	18 (9.1%)	2 (1.4%)	
Paramedic/Ambulance Worker	111 (14.4%)	84 (42.2%)	27 (18.5%)	
Correction Officer	81 (10.5%)	61 (30.7%)	20 (13.7%)	
Firefighter & Paramedic	12 (1.6%)	10 (5.0%)	2 (1.4%)	
Missing	2 (0.3%)	2 (0.3%)	-	
No	512	426 (67.9%)	86 (58.9%)	
Age (n=772)	42.1 (\pm 11.6)	42.1(\pm 11.6)	42.0 (\pm 11.3)	0.90
Gender				0.26
Male	412 (53.3%)	328 (52.3%)	84 (57.5%)	
Female	361 (46.7%)	299 (47.7%)	62 (42.5%)	
Missing	-	-	-	
Education				0.42
Partial/Complete Highschool or Less	10 (1.3%)	7 (1.1%)	3 (2.1%)	
High School Diploma	7 (0.9%)	6 (1.0%)	1 (0.7%)	
Partial/Complete Technical School	117 (15.1%)	92 (14.6%)	22 (15.1%)	
Partial/Complete University	68 (8.8%)	55 (8.8%)	13 (8.9%)	
Not Specified	135 (17.5%)	111 (17.7%)	16 (11.0%)	
High School not complete and no GED	31 (4.0%)	24 (3.8%)	6 (4.1%)	

High School Diploma/GED	233 (30.1%)	178 (28.4%)	47 (32.2%)	
Other Diploma/ Certificate	141 (18.2%)	109 (17.3%)	27 (18.5%)	
Missing	61 (7.9%)	45 (7.2%)	11 (7.5%)	
Occupational Category				0.02*
Management Occupations	39 (5.0%)	29 (4.6%)	10 (6.9%)	
Business, Finance, & Administration Occupations	51 (6.6%)	40 (6.4%)	11 (7.5%)	
Natural and Applied Sciences and Related Occupations	10 (1.3%)	5 (0.8%)	5 (3.4%)	
Health Occupations	154 (19.9%)	120 (19.1%)	34 (23.3%)	
Education, Law, Social & Community Government Services Occupations in Art, Culture, Recreation and Sport	192 (24.8%)	150 (23.9%)	42 (28.8%)	
Sales and Service Occupations	4 (0.1%)	4 (0.6%)	-	
Trades	72 (9.3%)	60 (9.6%)	12 (8.2%)	
Natural Resources, Agriculture and Related Production Occupations	224 (29.0%)	197 (31.4%)	27 (18.5%)	
Occupations in manufacturing and utilities	12 (1.6%)	11 (1.8%)	1 (0.7%)	
Missing	15 (1.9%)	11 (1.8%)	4 (2.7%)	
	-	-	-	
Primary Nature of Injury				0.06
Traumatic Injuries and Disorders	11 (1.4%)	9 (1.4%)	2 (1.4%)	
Traumatic Injuries to Bones, Nerves, and Spinal cord	33 (4.3%)	30 (4.8%)	3 (2.1%)	
Traumatic Injuries to Muscles Tendons, Ligaments, Joints	71 (9.2%)	64 (10.2%)	7 (4.8%)	
Open Wounds	25 (3.2%)	24 (3.8%)	1 (0.7%)	
Surface Wounds and Bruises	33 (4.3%)	28 (4.5%)	5 (3.4%)	
Burns	14 (1.8%)	11 (1.8%)	3 (2.1%)	
Intracranial Injuries	37 (4.8%)	33 (5.3%)	4 (2.7%)	
Multiple Traumatic Injuries and Disorders	17 (2.2%)	13 (2.1%)	4 (2.7%)	
Other Traumatic Injuries and Disorders	43 (5.6%)	37 (5.9%)	6 (4.1%)	
Nervous System and Sense Organs Disease	1 (0.1%)	1 (0.2%)		

Mental Disorders or Syndromes	458 (56.2%)	352 (56.1%)	106 (72.6%)	
Missing	30 (3.9%)	25 (4.0%)	5 (3.4%)	
Type of Accident				0.002**
Contact with Objects/Equipment	39 (5.0%)	37 (5.9%)	2 (1.4%)	
Falls	23 (3.0%)	20 (3.2%)	3 (2.1%)	
Bodily Reaction	88 (11.4%)	64 (10.2%)	24 (16.4%)	
Exposure to Harm	275 (35.6%)	217 (34.6%)	58 (39.7%)	
Transport Accidents	130 (16.8%)	119 (19.0%)	11 (7.5%)	
Fire/Explosions	9 (1.2%)	8 (1.3%)	1 (0.7%)	
Assault and Violence	205 (26.5%)	158 (25.2%)	47 (32.2%)	
Other	3 (0.4%)	3 (0.5%)		
Type of Injury				<0.001***
Traumatic/Physical Injury	311 (40.2%)	272 (43.4%)	39 (26.7%)	
Psychological	454 (58.7%)	349 (55.7%)	105 (71.9%)	
Unknown	8 (1.0%)	6 (1.0%)	2 (1.4%)	
Primary ICD-9 Diagnosis				<0.001***
Mental Health Condition	635 (82.1%)	500 (79.7%)	135 (92.5%)	
Musculoskeletal Injury	134 (17.3%)	124 (19.8%)	10 (6.8%)	
Missing	4 (1%)	3 (0.5%)	1 (0.7%)	
Secondary ICD-9 Diagnosis				<0.001***
Mental Health Condition	81 (10.5%)	46 (7.3%)	35 (24.0%)	
Musculoskeletal Injury	122 (15.8%)	107 (17.1%)	15 (10.3%)	
Missing	570 (73.7%)	474 (75.6%)	96 (65.8%)	
Job Attached at Admission				0.12
Yes	699 (90.4%)	572 (91.2%)	127 (87.0%)	
No	74 (9.6%)	55 (8.8%)	19 (13.0%)	
Claim Related Issues				0.08
Yes	20 (2.6%)	12 (1.9%)	8 (5.5%)	
No	309 (40.0%)	238 (38.0%)	71 (48.6%)	
Missing	444 (57.4%)	377 (60.1%)	67 (45.9%)	
Legal issues				0.96
Yes	21 (2.7%)	16 (2.6%)	5 (3.4%)	
No	297 (38.4%)	225 (35.9%)	72 (49.3%)	

Missing	455 (58.9%)	386 (61.6%)	69 (47.3%)	
Number of treatment days missed on average (n=486)	6.0 (\pm 7.5)	5.7 (\pm 7.0)	7.4 (\pm 9.0)	0.04*
Type of Rehabilitation Program admitted to (TPI Level at admission)				0.41
TPI Level 1	87 (11.3%)	74 (11.8%)	13 (8.9%)	
TPI Level 2	397 (51.4%)	325 (51.8%)	72 (49.3%)	
TPI Level 3	282 (36.5%)	223 (35.6%)	59 (40.4%)	
Missing	7 (0.9%)	5 (2.1%)	2 (1.4%)	
Average # of Previous Claims (n=772)	3.0 ^a	3.0 ^a	3.0 ^a	0.67 ^b
Anticipated Program Length (n=623)	38.2 (\pm 18.0)	39.8 (\pm 17.3)	31.6 (\pm 19.5)	<0.001***
Period between accident and assessment (n=772)	86.0 ^a	76.0 ^a	155.5 ^a	<0.001*** ^b
Program Length Admission to Discharge (n=769)	97.0 ^a	91.0 ^a	113.0 ^a	<0.001*** ^b
Psychological Variables				
Previous Trauma History				
Yes	541 (70.0%)	429 (68.4%)	112 (76.7%)	<0.001***
No	232 (30.0%)	134 (21.1%)	27 (18.5%)	
Substance Abuse				
Yes	158 (20.4%)	114 (18.2%)	44 (30.1%)	<0.001***
No	559 (72.3%)	472 (75.2%)	87 (59.6%)	
Missing	56 (7.2%)	41 (6.7%)	15 (10.3%)	
Suicide Risk				
No risk	75 (9.7%)	57 (9.1%)	18 (12.3%)	0.051
Low Risk	256 (33.1%)	199 (31.7%)	57 (39.0%)	
Medium/High Risk	22 (2.9%)	12 (1.9%)	10 (6.9%)	
Missing	420 (54.3%)	359 (57.3%)	85 (58.2%)	
Psychology Log¹				
Pain Intensity (n=627)	3.8 (\pm 2.8)	3.8 (\pm 2.8)	3.5 (\pm 2.7)	0.30
Stress (n=721)	7.0 (\pm 2.0)	7.0 (\pm 2.0)	7.1 (\pm 1.9)	0.50
Relaxation Skills (n=701)	4.1 (\pm 2.0)	4.2 (\pm 2.0)	3.9 (\pm 1.8)	0.15
Energy Levels (n=718)	3.8 (\pm 2.0)	3.9 (\pm 2.0)	3.3 (\pm 1.8)	0.003**
Sleep (hours/night) (n=718)	5.3 (\pm 1.8)	5.3 (\pm 1.7)	5.1 (\pm 1.9)	0.26
Mood (n=719)	3.9 (\pm 1.9)	4.0 (\pm 1.9)	3.6 (\pm 1.9)	0.07

Readiness to RTW (n=728)	2.4 (\pm 2.5)	25.7% (\pm 25.3%)	18.5% (\pm 20.4%)	0.002**
Clinical Variables				
SF-36 Scores²				
Physical Functioning (n=103)	20 ^a	17.5 ^a	30.0 ^a	<0.006** ^b
Role Physical (n=101)	18.8 ^a	18.8 ^a	25.0 ^a	<0.005** ^b
Bodily Pain (n=87)	63.0 (\pm 30.0)	62.1 (\pm 30.9)	66.3 (\pm 26.7)	0.59
General Health (n=122)	38.5 (\pm 20.1)	39.9 (\pm 19.5)	33.5 (\pm 15.4)	0.16
Vitality (n=130)	41.0 (\pm 15.2)	42.2 (\pm 15.0)	36.2 (\pm 15.4)	0.07
Social Functioning (n=118)	36.7 (\pm 24.2)	37.4 (\pm 24.6)	33.5 (\pm 22.6)	0.50
Role Emotional (n=84)	30.0 (\pm 27.5)	28.2 (\pm 26.9)	36.4 (\pm 29.3)	0.26
Mental Health (n=128)	42.2 (\pm 13.0)	42.6 (\pm 12.6)	40.3 (\pm 14.7)	0.42
Beck Depression Inventory-II				
Minimal/Mild	140 (18.1%)	127 (20.3%)	13 (8.9%)	<0.001***
Moderate/Severe	615 (79.6%)	483 (77.0%)	132 (90.4%)	
Missing	18 (2.3%)	17 (2.7%)	1 (0.7%)	
Beck Anxiety Inventory				
Minimal/Mild	176 (22.8%)	153 (24.4%)	23 (15.8%)	0.01*
Moderate/Severe	574 (74.3%)	451 (71.9%)	123 (84.2%)	
Missing	23 (3.0%)	23 (3.7%)	0	
TSI-2 Factor Scores				
Trauma (TR)				
Not indicated as Significant	259 (33.5%)	229 (36.5%)	30 (20.5%)	<0.001***
Elevated	362 (46.9%)	276 (44.0%)	86 (58.9%)	
Missing	152 (19.7%)	122 (19.5%)	30 (20.5%)	
Self-Disturbance (SE)				
Not indicated as Significant	468 (60.5%)	398 (63.5%)	70 (47.9%)	<0.001***
Elevated	154 (19.9%)	108 (17.2%)	46 (31.5%)	
Missing	151 (19.5%)	121 (19.3%)	30 (20.5%)	
Externalization (EX)				
Not indicated as Significant	506 (65.5%)	425 (67.8%)	81 (55.5%)	<0.001***
Elevated	116 (15.0%)	81 (12.9%)	35 (24.0%)	
Missing	151 (19.5%)	121 (19.3%)	30 (20.5%)	
Somatization (SO)				
				0.03*

Not indicated as Significant	528 (68.3%)	437 (69.7%)	91 (62.3%)	
Elevated	94 (12.2%)	69 (11.0%)	25 (17.1%)	
Missing	151 (19.5%)	121 (19.3%)	30 (20.5%)	
TSI-2 Subscale Scores				
TR – Dissociation				<0.001***
Not indicated as Significant	404 (52.3%)	349 (55.7%)	55 (37.7%)	
Elevated	217 (28.1%)	156 (24.9%)	61 (41.8%)	
Missing	152 (19.7%)	122 (19.5%)	30 (20.5%)	
TR – Relational Avoidance				<0.001***
Not indicated as Significant	539 (69.7%)	451 (71.9%)	88 (60.3%)	
Elevated	82 (10.6%)	54 (8.6%)	28 (19.2%)	
Missing	152 (19.7%)	122 (19.5%)	30 (20.5%)	
TR- Defensive Avoidance				<0.001***
Not indicated as Significant	356 (46.1%)	309 (49.3%)	47 (32.2%)	
Elevated	266 (34.4%)	197 (31.4%)	74 (47.2%)	
Missing	151 (19.5%)	121 (19.3%)	30 (20.5%)	
TR – Intrusive experiences				0.02*
Not indicated as Significant	216 (27.9%)	187 (29.8%)	29 (19.9%)	
Elevated	406 (52.6%)	319 (50.9%)	87 (59.6%)	
Missing	151 (19.5%)	121 (19.3%)	30 (20.5%)	
TR- Anxious Arousal				0.24
Not indicated as Significant	484 (62.6%)	389 (62.0%)	95 (65.1%)	
Elevated	138 (17.9%)	117 (18.7%)	21 (14.4%)	
Missing	151 (19.5%)	121 (19.3%)	30 (20.5%)	
TR – Hyperarousal				<0.001***
Not indicated as Significant	303 (39.2%)	260 (41.5%)	43 (29.5%)	
Elevated	319 (41.3%)	246 (39.2%)	73 (50.0%)	
Missing	151 (19.5%)	121 (19.3%)	30 (20.5%)	
SE – Depression				<0.001***
Not indicated as Significant	374 (48.4%)	331 (52.8%)	43 (29.5%)	
Elevated	248 (32.1%)	175 (27.9%)	73 (50.0%)	
Missing	151 (19.5%)	121 (19.3%)	30 (20.5%)	

SE - Anxiety				<0.001***
Not indicated as Significant	362 (46.8%)	311 (49.6%)	51 (34.9%)	
Elevated	260 (33.6%)	195 (31.1%)	65 (44.5%)	
Missing	151 (19.5%)	121 (19.3%)	30 (20.5%)	
SE – Insecurity				0.78
Not indicated as Significant	562 (72.7%)	458 (73.0%)	104 (71.4%)	
Elevated	60 (7.8%)	48 (7.7%)	12 (8.2%)	
Missing	151 (19.5%)	121 (19.3%)	30 (20.5%)	
SE – Self-Reference				0.51
Not indicated as Significant	556 (71.9%)	455 (72.6%)	101 (69.2%)	
Elevated	65 (8.4%)	51 (8.1%)	14 (9.6%)	
Missing	152 (19.7%)	121 (19.3%)	31 (21.2%)	
SE – Self Awareness				<0.001***
Not indicated as Significant	523 (67.7%)	438 (69.9%)	85 (58.2%)	
Elevated	98 (12.7%)	67 (10.7%)	31 (21.2%)	
Missing	152 (19.7%)	122 (19.5%)	30 (20.5%)	
EX – Anger				<0.001***
Not indicated as Significant	414 (53.6%)	352 (56.1%)	62 (42.5%)	
Elevated	208 (26.9%)	153 (24.4%)	55 (37.6%)	
Missing	151 (19.5%)	122 (19.5%)	29 (19.9%)	
EX – Tension Reduction				<0.001***
Not indicated as Significant	495 (64.0%)	418 (66.7%)	77 (52.7%)	
Elevated	127 (16.4%)	87 (13.9%)	40 (27.4%)	
Missing	151 (19.5%)	122 (19.5%)	29 (19.9%)	
EX – Sex Disturbance				0.01*
Not indicated as Significant	581 (75.2%)	479 (76.4%)	102 (69.9%)	
Elevated	39 (5.0%)	26 (4.1%)	13 (8.9%)	
Missing	153 (19.8%)	122 (19.5%)	31 (21.2%)	
EX – Suicidal Behaviour				0.002**
Not indicated as Significant	566 (73.2%)	469 (74.8%)	97 (66.4%)	
Elevated	56 (7.2%)	37 (5.9%)	19 (13.0%)	
Missing	151 (19.5%)	121 (19.3%)	30 (20.5%)	
EX – Suicidal Ideation				<0.001***

Not indicated as Significant	510 (66.0%)	429 (68.4%)	81 (55.5%)	
Elevated	112 (14.5%)	77 (12.3%)	35 (24.0%)	
Missing	151 (19.5%)	121 (19.3%)	30 (20.5%)	
SO – Somatic Pain				0.73
Not indicated as Significant	577 (74.6%)	471 (75.1%)	106 (72.6%)	
Elevated	44 (5.7%)	35 (5.6%)	9 (6.2%)	
Missing	152 (19.7%)	121 (19.3%)	31 (21.2%)	
SO – Somatic General				0.89
Not indicated as Significant	531 (68.7%)	433 (69.1%)	98 (67.1%)	
Elevated	89 (11.5%)	72 (11.5%)	17 (11.6%)	
Missing	153 (19.8%)	122 (19.5%)	31 (21.2%)	
Outcome Variables				
RTW Outcome at Program Discharge				<0.001***
RTW/FTW	419 (54.2%)	370(59.0%)	49 (33.6%)	
Not FTW	353 (45.7%)	256 (40.8%)	97 (66.4%)	
Missing	1 (0.1%)	1 (0.16%)	-	
Time Loss Benefit (TD01) in the following year (Mean # of Days)	85.5 (\pm 62.9)	80.67 (\pm 58.14)	121.30 (\pm 84.09)	0.006**
Time Loss Benefit (TD02) in the following year (Mean # of Days)	48.2 (\pm 39.7)	47.68 (\pm 38.52)	56.33 (\pm 58.89)	0.61

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

RTW = Return-to-work; FTW = Fit-to-work; SF-36 = 36-item Short Form Health Survey; TSI-2 = Trauma Symptom Inventory-2; TR = TSI-2 Trauma Factor Scale; SE = TSI-2 Self-Disturbance Factor Scale; EX = TSI-2 Externalization Factor Scale; SO = TSI-2 Somatization Factor Scale.

¹ Psychology Log subscale scores are expressed as an integer ranging between 0 and 10, except for 'Sleep,' which represents average hours of sleep per night, and 'Readiness to RTW,' which is displayed as a percentage from 0 to 100.

² SF-36 scores are expressed as an integer from 0 to 100, with lower scores representing a higher degree of disability.

^a Indicates that median was used instead of mean due to normality concerns.

^b P-value represents the significance level from the Kruskal-Wallis test.

Significant differences in patient-reported outcome measure variables were also observed between the groups (see Table 4). The comorbid psychological diagnoses group was significantly more likely to report moderate/severe elevations on measures of depression and anxiety (90.4% versus 77.0% on the BDI-II, $p < 0.001$; 84.2% versus 71.9% on the BAI, $p = 0.01$). Individuals diagnosed with comorbid psychological conditions had elevated scores on multiple factors and subscales of the TSI-2 (see Table 4). Notably, individuals in the comorbid psychological diagnoses condition had elevated scores on the trauma (58.9% versus 44.0%, $p < 0.001$), self-disturbance (31.5% versus 17.2%, $p < 0.001$), externalization (24.0% versus 12.9%, $p < 0.001$), and somatization factor scales (17.1% versus 11.0%, $p = 0.03$). Further, individuals in the comorbid diagnoses group reported elevated scores on the dissociation (41.8% versus 24.9%, $p < 0.001$), relational avoidance (19.2% versus 8.6%, $p < 0.001$), defensive avoidance (47.2% versus 31.4%, $p < 0.001$), intrusive experiences (59.6% versus 50.9%, $p = 0.02$), hyperarousal (50.0% versus 39.2%, $p = 0.01$), depression (50.0% versus 27.9%, $p < 0.001$), anxiety (44.5% versus 31.1%, $p < 0.001$), self-awareness (21.2% versus 10.7%, $p < 0.001$), anger (37.6% versus 24.4%, $p < 0.001$), tension reduction (27.4% versus 13.9%, $p < 0.001$), sexual disturbances (8.9% versus 4.1%, $p = 0.01$), suicidal behaviour (13.0% versus 5.9%, $p = 0.002$), and suicidal ideation subscales (24.0% versus 12.3%, $p < 0.001$). Finally, measures on WCB-Alberta's Psychology Log indicated that workers in the comorbid psychological diagnoses condition had lower self-reported energy levels (3.3 versus 3.9 out of 10, $p = 0.003$) and lower self-reported readiness to RTW ratings (18.5% versus 25.7%, $p = 0.002$).

3.2. Impact of Psychological Comorbidity on RTW Rate Following Rehabilitation

RTW outcomes were significantly better for individuals with a single versus those with comorbid psychological diagnoses (59.0% versus 33.6%, $p < 0.001$). Furthermore, a subgroup

analysis determined that RTW outcomes were not significantly different between psychological comorbidity categories ($p = 0.36$; see Appendix B, Table 2). Descriptive statistics indicated that numerous demographic, administrative and psychological variables were also different between the non-RTW, FTW and RTW groups (see Table 5). When the RTW and FTW were grouped together and compared to the non-RTW group, the same key demographic, administrative and psychological variables were significant (see Appendix B, Table 3). Further statistical comparison between the RTW and FTW groups revealed that they were not significantly different across key variables (i.e., variables selected for the final regression model), except for self-reported readiness to RTW ($p < 0.001$).

Univariate odds ratios (OR) for each predictor variable's association with RTW outcomes are shown in Table 6. The final multivariable logistic regression model indicated that workers had higher odds of successful RTW if they had a single psychological diagnosis (OR 2.05, 95% CI 1.28 - 3.29, $p = 0.003$) and if they were initially diagnosed with a physical ICD-9 diagnosis (OR 1.90, 95% CI 1.13 - 3.19, $p = 0.02$). Further, individuals were found to have higher odds of RTW if they had non-elevated scores on the TSI-2 trauma factor (OR 1.71, 95% CI 0.92 - 2.29, $p = 0.01$) and if they reported a higher readiness for RTW at program intake (OR 1.23, 95% CI 1.16 - 2.51, $p < 0.001$). Lower odds of RTW were also found for individuals in education, law and social, community and government occupations (OR 0.54, 95% CI 0.34 - 0.85, $p = 0.01$). Finally, trauma history (OR 0.70, 95% CI 0.46 - 1.07, $p = 0.10$), minimal/mild BAI score (OR 1.46, 95% CI 0.92 - 2.29, $p = 0.11$), working in trades occupations (OR 0.70, 95% CI 0.46 - 1.07, $p = 0.10$), being male (OR 1.09, 95% CI 0.75 - 1.57, $p = 0.66$), and age (OR 1.01, 95% CI 0.99 - 1.02, $p = 0.35$) were not statistically significant in the final model.

Table 5

Characteristics of Workers classified as Able to Return-to-work, Fit-to-Work, and Not Able to Return-to-Work Admitted to the Workers Compensation Board of Alberta Traumatic Psychological Injury Rehabilitation Programs between the Years 2017-2019

Variable	Return-to-work at Pre-accident Levels			p-value (Two-tailed) <i>t</i> or χ^2
	RTW Mean \pm SD <i>or</i> n (%)	FTW Mean \pm SD <i>or</i> n (%)	No RTW/FTW Mean \pm SD <i>or</i> n (%)	
Full Sample				
Demographic/Administrative Variables	(n=110)	(n=309)	(n=353)	
Public Safety Personnel				
Yes	28 (25.5%)	90 (29.1%)	139 (37.7%)	0.004*
Police	1	15	19	
Firefighter	5	4	11	
Paramedic/Ambulance Worker	14	45	52	
Correction Officer	6	22	53	
Firefighter & Paramedic	2	4	5	
No	82 (74.5%)	218 (70.6%)	214 (60.6%)	
Missing	-	1 (0.3%)	-	
Psychological Comorbidity				<0.001***
Comorbid Psychological Diagnoses	10 (9.1%)	39 (12.6%)	97 (27.5%)	
Single Psychological Diagnosis	100 (90.9%)	270 (87.4%)	256 (72.5%)	
Age (in years; n=772)	40.8 (\pm 11.2)	43.3 (\pm 11.9)	41.4 (\pm 11.3)	
Gender				0.49
Male	57 (51.8%)	173 (56.0%)	182 (51.6%)	
Female	53 (48.2%)	136 (44.0%)	171 (48.4%)	
Missing	-	-	-	
Education				0.76
Partial/Complete Highschool or Less	1 (0.9%)	2 (0.6%)	7 (2.0%)	
High School Diploma	1 (0.9%)	5 (1.6%)	1 (0.3%)	

Partial/Complete Technical School	19 (17.3%)	48 (15.5%)	47 (13.3%)	
Partial/Complete University	14 (12.7%)	26 (8.4%)	28 (7.9%)	
Not Specified	15 (13.6%)	48 (15.5%)	64 (18.1%)	
High School not complete and no GED	6 (5.5%)	14 (4.5%)	10 (2.8%)	
High School Diploma/GED	31 (28.2%)	84 (27.2%)	109 (30.9%)	
Other Diploma/ Certificate	17 (15.5%)	59 (19.1%)	60 (17.0%)	
Missing	6 (5.5%)	23 (7.4%)	27 (7.6%)	
Occupational Category				0.01*
Management Occupations	9 (8.2%)	15 (4.9%)	15 (4.2%)	
Business, Finance, & Administration Occupations	8 (7.3%)	20 (6.5%)	23 (6.5%)	
Natural and Applied Sciences and Related Occupations	2 (1.8%)	4 (1.3%)	4 (1.1%)	
Health Occupations	24 (21.8%)	61 (19.7%)	68 (19.3%)	
Education, Law, Social & Community Government Services	18 (16.4%)	61 (19.7%)	113 (32.0%)	
Occupations in Art, Culture, Recreation and Sport	2 (1.8%)	2 (0.6%)	-	
Sales and Service Occupations	11 (10.0%)	35 (11.3%)	26 (7.4%)	
Trades	32 (29.1%)	100 (32.4%)	92 (26.1%)	
Natural Resources, Agriculture and Related	-	5 (1.6%)	7 (2.0%)	
Production Occupations				
Occupations in Manufacturing and Utilities	4 (3.6%)	6 (1.9%)	5 (1.4%)	
Primary Nature of Injury				0.05*
Traumatic Injuries and Disorders	1 (0.9%)	7 (2.3%)	3 (0.8%)	
Traumatic Injuries to Bones, Nerves, and Spinal cord	5 (4.5%)	14 (4.5%)	14 (4.0%)	
Traumatic Injuries to Muscles Tendons, Ligaments, Joints	13 (11.8%)	35 (11.3%)	23 (6.5%)	
Open Wounds	2 (1.8%)	10 (3.2%)	13 (3.7%)	

Surface Wounds and Bruises	6 (5.5%)	15 (4.9%)	12 (3.4%)	
Burns	4 (3.6%)	8 (2.6%)	2 (0.6%)	
Intracranial Injuries	7 (6.4%)	16 (5.2%)	14 (4.0%)	
Multiple Traumatic Injuries and Disorders	2 (1.8%)	3 (1.0%)	12 (3.4%)	
Other Traumatic Injuries and Disorders Nervous System and Sense Organs Disease	5 (4.5%)	14 (4.5%)	24 (6.8%)	
	1 (0.8%)	-	-	
Mental Disorders or Syndromes	58 (52.7%)	177 (57.3%)	232 (62.9%)	
<i>Missing</i>	6 (5.5%)	10 (3.2%)	14 (4.0%)	
Type of Accident				0.13
Contact with Objects/Equipment	6 (5.5%)	14 (4.5%)	19 (5.4%)	
Falls	6 (5.5%)	6 (1.9%)	11 (3.1%)	
Bodily Reaction	7 (6.4%)	37 (12.0%)	44 (12.5%)	
Exposure to Harm	37 (3.6%)	101 (32.7%)	136 (38.5%)	
Transport Accidents	26 (23.6%)	62 (20.1%)	42 (11.9%)	
Fire/Explosion	1 (0.9%)	4 (1.3%)	4 (1.1%)	
Assault and Violence	26 (23.6%)	83 (26.9%)	96 (27.2%)	
Other	-	2 (0.6%)	1 (0.3%)	
<i>Missing</i>	1 (0.9%)	-	1 (0.3%)	
Type of Injury				0.21
Traumatic/Physical Injury	50 (45.5%)	131 (42.4%)	130 (36.8%)	
Psychological	59 (53.6%)	177 (57.3%)	217 (61.5%)	
<i>Unknown</i>	1 (0.9%)	1 (0.3%)	6 (1.7%)	
Primary ICD-9 Diagnosis				<0.0001***
Mental Health Condition	31 (28.2%)	64 (20.7%)	312 (88.4%)	
Musculoskeletal Injury	77 (70.0%)	245 (79.3%)	39 (11.0%)	
<i>Missing</i>	2 (1.8%)	2 (0.6%)	2 (0.6%)	
Secondary ICD-9 Diagnosis				0.05*
Mental Health Condition	26 (23.6%)	55 (17.8%)	41 (11.6%)	
Musculoskeletal Injury	11 (10.0%)	29 (9.4%)	41 (11.6%)	
<i>Missing</i>	73 (66.4%)	225 (72.8%)	271 (76.8%)	
Job Attached at Admission				0.44

Yes	103 (93.6%)	279 (90.3%)	316 (89.5%)	
No	7 (6.4%)	30 (9.7%)	37 (10.5%)	
Claim Related Issues				0.35
Yes	1 (0.9%)	5 (1.6%)	14 (4.0%)	
No	41 (37.3%)	99 (32.0%)	168 (47.5%)	
Missing	68 (61.8%)	205 (66.3%)	171 (48.4%)	
Legal issues				0.73
Yes	3 (2.7%)	8 (2.6%)	10 (2.8%)	
No	34 (30.9%)	95 (30.7%)	167 (47.3%)	
Missing	73 (66.4%)	206 (66.7%)	176 (49.9%)	
Number of treatment days missed on average (n=486)	4.8 (\pm 6.8)	5.9 (\pm 8.0)	6.4 (\pm 7.3)	0.39
Type of Rehabilitation Program admitted to (TPI Level at admission)				0.02*
TPI Level 1	17 (15.5%)	37 (12.0%)	33 (9.3%)	
TPI Level 2	67 (60.9%)	150 (48.5%)	179 (50.7%)	
TPI Level 3	26 (23.6%)	120 (38.8%)	136 (38.5%)	
Missing	-	2 (0.6%)	5 (1.4%)	
Average # of Previous Compensation Claims (n=772)	2.0 ^a	3.0 ^a	3.0 ^a	0.92 ^b
Anticipated Program Length (n=623)	37.2 (\pm 17.8)	41.0 (\pm 16.0)	36.5 (\pm 19.2)	0.02*
Period Between Accident and Assessment (n=769)	86.5 ^a	70.0 ^a	102.0 ^a	<0.001 ^{b****}
Psychological Variables				
Previous Trauma History				<0.001***
Yes	72 (65.5%)	193 (62.5%)	275 (77.9%)	
No	38 (34.5%)	116 (37.5%)	78 (22.1%)	
Substance Abuse				0.03*
Yes	23 (20.9%)	49 (15.9%)	86 (24.4%)	
No	81 (73.6%)	234 (75.7%)	243 (68.8%)	
Missing	6 (5.5%)	26 (8.4%)	24 (6.8%)	
Suicide Risk				0.21
No risk	9 (8.2%)	24 (7.8%)	42 (11.9%)	

Low Risk	28 (25.5%)	74 (23.9%)	153 (43.3%)	
Medium/High Risk	-	11 (3.6%)	11 (3.1%)	
Missing	73 (66.4%)	200 (64.7%)	147 (41.6%)	
Psychology Log¹				
Pain Intensity (<i>n</i> =627)	3.7 (\pm 2.9)	4.0 (2.9)	3.6 (\pm 2.7)	0.26
Stress (<i>n</i> =721)	6.5 (\pm 2.3)	6.9 (2.0)	7.3 (\pm 1.9)	<0.001***
Relaxation Skills (<i>n</i> =701)	4.5 (\pm 1.8)	4.3 (2.0)	3.9 (\pm 2.0)	0.01*
Energy Levels (<i>n</i> =718)	4.2 (\pm 1.7)	4.0 (2.1)	3.5 (\pm 1.9)	<0.001***
Sleep (hours/night) (<i>n</i> =718)	5.5 (\pm 1.6)	5.4 (1.8)	5.1 (\pm 1.8)	0.04*
Mood (<i>n</i> =719)	4.5 (\pm 1.9)	4.0 (1.9)	3.6 (\pm 1.8)	<0.001***
Readiness to RTW (<i>n</i> =728)	38.5% (\pm 27.1%)	26.7% (25.4%)	18.4% (\pm 21.0%)	<0.001***
Psychometric Measures				
SF-36 Score²				
Physical Functioning (<i>n</i> =103)	25.0 ^a	15.0 ^a	35.0 ^a	0.01 ^{b*}
Role Physical (<i>n</i> =101)	18.8 ^a	21.9 ^a	25.0 ^a	0.42 ^b
Bodily Pain (<i>n</i> =87)	69.2 (\pm 8.4)	61.1 (\pm 3.9)	64.4 (\pm 33.3)	0.66
General Health (<i>n</i> =122)	40.4 (\pm 6.1)	38.6 (\pm 2.0)	37.0 (\pm 25.0)	0.87
Vitality (<i>n</i> =130)	42.8 (\pm 3.2)	40.6 (\pm 1.7)	41.3 (\pm 14.1)	0.87
Social Functioning (<i>n</i> =118)	35.2 (\pm 7.2)	36.7 (\pm 2.7)	37.5 (\pm 21.5)	0.96
Role Emotional (<i>n</i> =84)	23.5 (\pm 7.0)	28.9 (\pm 3.7)	38.2 (\pm 28.7)	0.33
Mental Health (<i>n</i> =128)	47.1 (\pm 3.1)	42.0 (\pm 1.4)	39.6 (\pm 11.8)	0.18
Beck Depression Inventory-II				
Minimal/Mild	22 (20.0%)	75 (24.3%)	43 (12.2%)	
Moderate/Severe	84 (76.4%)	228 (73.8%)	302 (85.6%)	
Missing	4 (3.6%)	6 (1.9%)	8 (2.3%)	
Beck Anxiety Inventory				
Minimal/Mild	33 (30.0%)	88 (28.5%)	55 (15.6%)	<0.001***
Moderate/Severe	71 (64.5%)	215 (69.6%)	287 (81.3%)	
Missing	6 (5.5%)	6 (1.9%)	11 (3.1%)	
TSI-2 Factor Scores				
Trauma (TR)				<0.001***
Not indicated as Significant	48 (43.6%)	122 (39.5%)	89 (25.2%)	
Elevated	37 (33.6%)	117 (37.9%)	207 (58.6%)	

<i>Missing</i>	25 (22.7%)	70 (22.7%)	57 (16.1%)	
Self-Disturbance (SE)				<0.001***
Not indicated as Significant	70 (63.6%)	197 (63.8%)	201 (56.9%)	
Elevated	15 (13.6%)	43 (13.9%)	95 (26.9%)	
<i>Missing</i>	25 (22.7%)	69 (22.3%)	57 (16.1%)	
Externalization (EX)				0.01*
Not indicated as Significant	69 (62.7%)	209 (67.6%)	228 (64.6%)	
Elevated	16 (14.5%)	31 (10.0%)	68 (19.3%)	
Missing	25 (22.7%)	69 (22.3%)	57 (16.1%)	
Somatization (SO)				0.02*
Not indicated as Significant	76 (69.1%)	213 (68.9%)	239 (67.7%)	
Elevated	9 (8.2%)	27 (8.7%)	57 (16.1%)	
<i>Missing</i>	25 (22.7%)	69 (22.3%)	57 (16.1%)	
<i>TSI-2 Subscale Scores</i>				
TR – Dissociation				<0.001***
Not indicated as Significant	64 (5.2%)	173 (56.0%)	167 (47.3%)	
Elevated	21 (19.1%)	66 (21.4%)	129 (36.5%)	
<i>Missing</i>	25 (22.7%)	70 (22.7%)	57 (16.1%)	
TR – Relational Avoidance				0.02*
Not indicated as Significant	72 (65.5%)	220 (71.2%)	247 (70.0%)	
Elevated	13 (11.8%)	20 (6.5%)	48 (13.6%)	
<i>Missing</i>	25 (22.7%)	69 (22.3%)	58 (16.4%)	
TR- Defensive Avoidance				<0.001***
Not indicated as Significant	56 (50.9%)	155 (50.2%)	144 (40.8%)	
Elevated	29 (26.4%)	85 (27.5%)	152 (43.1%)	
<i>Missing</i>	25 (22.7%)	69 (22.3%)	57 (16.1%)	
TR – Intrusive experiences				<0.001***
Not indicated as Significant	38 (34.5%)	103 (33.3%)	75 (21.1%)	
Elevated	47 (42.7%)	137 (44.3%)	221 (62.6%)	
<i>Missing</i>	25 (22.7%)	69 (22.3%)	57 (16.1%)	
TR- Anxious Arousal				0.68
Not indicated as Significant	66 (60.0%)	183 (59.2%)	235 (66.6%)	
Elevated	19 (17.3%)	57 (18.4%)	61 (17.3%)	

<i>Missing</i>	25 (22.7%)	69 (22.3%)	57 (16.1%)	
TR – Hyperarousal				0.01*
Not indicated as Significant	46 (41.8%)	131 (42.4%)	126 (35.7%)	
Elevated	39 (35.5%)	109 (35.3%)	170 (48.2%)	
<i>Missing</i>	25 (22.7%)	(69 (22.3%)	57 (16.1%)	
SE – Depression				<0.001***
Not indicated as Significant	57 (51.8%)	165 (53.4%)	152 (43.1%)	
Elevated	28 (25.5%)	75 (24.3%)	144 (40.8%)	
<i>Missing</i>	25 (22.7%)	69 (22.3%)	57 (16.1%)	
SE - Anxiety				0.003*
Not indicated as Significant	54 (49.1%)	156 (50.5%)	151 (42.8%)	
Elevated	31 (28.2%)	84 (27.2%)	145 (41.1%)	
<i>Missing</i>	25 (22.7%)	69 (22.3%)	57 (16.1%)	
SE – Insecurity				0.70
Not indicated as Significant	75 (68.2%)	216 (69.9%)	270 (76.5%)	
Elevated	10 (9.1%)	24 (7.8%)	29 (8.2%)	
<i>Missing</i>	25 (22.7%)	69 (22.3%)	57 (16.1%)	
SE – Self-Reference				0.57
Not indicated as Significant	79 (71.8%)	214 (69.3%)	263 (74.5%)	
Elevated	6 (5.5%)	26 (8.4%)	32 (9.1%)	
<i>Missing</i>	25 (22.7%)	69 (22.3%)	58 (16.4%)	
SE – Self Awareness				0.08
Not indicated as Significant	73 (66.4%)	211 (68.3%)	239 (67.7%)	
Elevated	12 (10.9%)	29 (9.4%)	56 (15.9%)	
<i>Missing</i>	25 (22.7%)	69 (22.3%)	58 (16.4%)	
EX – Anger				<0.001***
Not indicated as Significant	55 (50.0%)	181 (58.6%)	177 (50.1%)	
Elevated	30 (27.3%)	59 (19.1%)	119 (33.7%)	
<i>Missing</i>	25 (22.7%)	69 (22.3%)	57 (16.1%)	
EX – Tension Reduction				0.01*
Not indicated as Significant	64 (58.2%)	206 (66.7%)	225 (63.7%)	
Elevated	20 (18.2%)	34 (11.0%)	72 (20.4%)	
<i>Missing</i>	26 (23.6%)	69 (22.3%)	56 (15.9%)	

EX – Sex Disturbance				0.87
Not indicated as Significant	79 (71.8%)	223 (72.2%)	278 (78.8%)	
Elevated	6 (5.5%)	16 (5.2%)	17 (4.8%)	
Missing	25 (22.7%)	70 (22.7%)	58 (16.4%)	
EX – Suicidal Behaviour				0.63
Not indicated as Significant	75 (68.2%)	219 (70.9%)	271 (76.8%)	
Elevated	10 (9.1%)	21 (6.8%)	25 (7.1%)	
Missing	25 (22.7%)	69 (22.3%)	57 (16.1%)	
EX – Suicidal Ideation				0.23
Not indicated as Significant	69 (62.7%)	205 (66.3%)	236 (66.9%)	
Elevated	16 (14.5%)	35 (11.3%)	60 (17.0%)	
Missing	25 (22.7%)	69 (22.3%)	57 (16.1%)	
SO – Somatic Pain				0.79
Not indicated as Significant	79 (71.8%)	225 (72.8%)	272 (77.1%)	
Elevated	6 (5.5%)	15 (4.9%)	23 (6.5%)	
Missing	25 (22.7%)	69 (22.3%)	58 (16.4%)	
SO – Somatic General				0.98
Not indicated as Significant	73 (66.4%)	205 (66.3%)	253 (71.7%)	
Elevated	12 (10.9%)	34 (11.0%)	42 (11.9%)	
Missing	25 (22.7%)	70 (22.7%)	58 (16.4%)	
Validity Scale				<0.001***
Atypical	14 (12.7%)	39 (12.6%)	86 (24.4%)	
Invalid	12 (10.9%)	32 (10.4%)	26 (7.4%)	
Valid	71 (64.5%)	203 (65.7%)	211 (59.8%)	
Missing	13 (11.8%)	35 (11.3%)	30 (8.5%)	

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

RTW = Return-to-work; FTW = Fit-to-work; SF-36 = 36-item Short Form Health Survey; TSI-2 = Trauma Symptom Inventory-2; TR = TSI-2 Trauma Factor Scale; SE = TSI-2 Self-Disturbance Factor Scale; EX = TSI-2 Externalization Factor Scale; SO = TSI-2 Somatization Factor Scale.

¹ Psychology Log subscale scores are expressed as an integer ranging between 0 and 10, except for 'Sleep,' which represents average hours of sleep per night, and 'Readiness to RTW,' which is displayed as a percentage from 0 to 100.

² SF-36 scores are expressed as an integer from 0 to 100, with lower scores representing a higher degree of disability.

^a Indicates that median was used instead of mean due to normality concerns.

^b P-value represents the significance level from the Kruskal-Wallis test.

Table 6

Logistic Regression Analysis Examining Return-to-Work and Failure to Return-to-Work in Workers Admitted to Worker's Compensation Board of Alberta's Traumatic Psychological Injury Program (n=562)

	Unadjusted Odds Ratio (95% Confidence Interval)	<i>p</i> -value	Adjusted Odds Ratio (95% Confidence Interval)	<i>p</i> -value
Block 1				
Demographic and Administrative variables				
Psychological Comorbidity				
Single Diagnosis	2.63 (1.69 – 4.09)	<0.001***	2.63 (1.69 – 4.09)	<0.001***
Nagelkerke R Square value	-		0.045	
Block 2				
Demographic and Administrative variables				
Psychological Comorbidity				
Single Diagnosis	2.63 (1.69 – 4.09)	<0.001***	2.66 (1.71 – 4.16)	<0.001***
Age	1.00 (0.99 – 1.02)	0.88	1.002 (0.99 – 1.02)	0.82
Gender				
Male	1.08 (0.78 – 1.51)	0.63	1.14 (0.81 – 1.60)	0.46
Nagelkerke R Square value	-		0.046	
Block 3				
Demographic and Administrative variables				
Psychological Comorbidity				
Single Diagnosis	2.63 (1.69 – 4.09)	<0.001***	2.46 (1.56 – 3.87)	<0.001***
Age	1.00 (0.99 – 1.02)	0.88	1.00 (0.99 – 1.02)	0.81
Gender				
Male	1.08 (0.78 – 1.51)	0.63	1.08 (0.76 – 1.54)	0.65
Occupation				

Other (e.g., Management, applied sciences, sales and services, manufacturing, business, finance, and administration etc.)	1.0		1.0	
Trades	0.76 (0.51 – 1.13)	0.17	0.70 (0.47 – 1.06)	0.09
Education, Law, Social and Community in Government (Including Public Safety Personnel)	0.55 (0.36 – 0.84)	0.005*	0.59 (0.39 – 0.91)	0.02*
History of Trauma Exposure				
Yes	0.58 (0.39 – 0.86)	0.006**	0.66 (0.44 – 0.99)	0.05*
Primary ICD Diagnosis				
Physical	2.22 (1.38 – 3.59)	0.001**	1.86 (1.130 – 3.06)	0.02*
Psychological	1.0		1.0	
Nagelkerke R Square value	-		0.09	
Block 4 (Full model)				
Demographic and Administrative variables				
Psychological Comorbidity				
Single Diagnosis	2.63 (1.69 – 4.09)	<0.001***	2.05 (1.28 – 3.29)	0.003**
Age	1.00 (0.99 – 1.02)	0.88	1.01 (0.99 – 1.02)	0.35
Gender				
Male	1.08 (0.78 – 1.51)	0.63	1.09 (0.75 – 1.57)	0.66
Occupation				
Other (e.g., Management, applied sciences, sales and services, manufacturing, business, finance, and administration etc.)	1.0		1.0	
Trades	0.76 (0.51 – 1.13)	0.17	0.70 (0.46 – 1.07)	0.10
Education, Law, Social and Community in Government (Including Public Safety Personnel)	0.55 (0.36 – 0.84)	0.005**	0.54 (0.34 – 0.85)	0.008**
History of Trauma Exposure				
Yes	0.58 (0.39 – 0.86)	0.006**	0.70 (0.46 – 1.07)	0.10

Primary ICD Diagnosis				
Physical	2.22 (1.38 – 3.59)	0.001**	1.90 (1.13 – 3.19)	0.02*
Psychological/Psychometric Variables				
BAI				
Minimal/Mild	2.08 (1.38 – 3.14)	<0.001***	1.46 (0.92 – 2.29)	0.11
Moderate/Severe	1.0		1.0	
TSI-2 Trauma				
Non-Clinical/Not Indicated	2.42 (1.71 – 3.42)	<0.001***	1.71 (1.16 – 2.51)	0.006**
Clinical	1.0		1.0	
Readiness to Return-to-Work	1.26 (1.17 – 1.36)	<0.001***	1.23 (1.14 – 1.34)	<0.001***
Nagelkerke R Square value	-		0.20	

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TSI-2 = Trauma Symptom Inventory-2; BAI = Beck's Anxiety Inventory

3.2.1. Interaction of Gender and PSP Status with RTW

Statistically significant interactions between claimant gender and multiple factors predictive of RTW were identified (see Appendix B, Table 4). First, in the final model, females were less likely to RTW than males if they had a comorbid psychological diagnosis (OR 0.35, 95% CI 0.13 – 0.94, $p = 0.04$). Further, females in trades industries (OR 0.41, 95% CI 0.17 – 0.96, $p = 0.04$) and in education, law and social, community and government occupations (OR 0.34, 95% CI 0.14 -0.85, $p = 0.02$) were less likely to RTW. An interaction between employment as a PSP and a history of trauma was also found (see Appendix B, Table 5). In the final model, PSP without a self-reported history of psychological trauma were more likely to RTW (OR 3.27, 95% CI 1.06 – 10.12, $p = 0.04$). Finally, significant interactions were present between the comorbid psychological diagnoses status and factors predictive of RTW (see Appendix B, Table 6). Beyond the previously mentioned interaction with gender, having a single psychological diagnosis was associated with higher RTW rates in individuals in trades occupations (OR 5.072, 95% CI 1.44 – 17.94, $p = 0.01$).

Chapter 4: Discussion

4.1. Factors Associated with RTW at Program Discharge

To the author's knowledge, this is the first study to examine the RTW outcomes of individuals with trauma-related and comorbid psychological diagnoses following treatment in a multidisciplinary rehabilitation program. Our results indicate that numerous factors were associated with RTW outcome at program discharge. Mainly, in support of our primary hypothesis, individuals with comorbid psychological diagnoses were found to RTW less frequently than individuals with solely a trauma-related psychological diagnosis. Even after adjusting for other significant predictors of RTW, such as trauma history, occupation, self-reported readiness to RTW, BAI score, and the TSI-2 trauma factor, comorbid psychological diagnoses remained a significant predictor of RTW outcome.

Although the impact of comorbid psychological diagnoses on RTW outcomes has not been adequately examined, previous research has investigated how psychological symptom severity influences the ability to RTW. For example, previous research reports worse RTW outcomes in individuals with elevated symptoms of depression, anxiety, and posttraumatic stress (Anderson et al., 2015; De Jonge et al., 2014; Turi et al., 2019; Van der Vlegel et al., 2022). These findings are relevant, as previous research suggests that elevated psychological symptom severity is associated with increased rates of psychological comorbidity (Momartin et al., 2004; Spinhoven et al., 2014). In fact, one study compared individuals with PTSD to individuals with PTSD and comorbid depression and found that individuals with comorbid depression had higher PTSD symptom severity and greater overall psychological dysfunction (Momartin et al., 2004). Consistent with this, our results indicated elevations in measures of anxiety, depression and posttraumatic stress in the comorbid psychological diagnoses group. Based on these results and

the suggestions of previous literature, we can infer that there is a relationship between the severity of psychological symptoms and psychological comorbidity. Therefore, our finding that RTW outcomes are worse in individuals with comorbid psychological diagnoses appears to be consistent with the results of previous literature, which report worse RTW outcomes in individuals reporting elevated psychological symptoms (Anderson et al., 2015).

Furthermore, research examining comorbid psychological conditions, such as PTSD and MDD in other settings has demonstrated that the degree of self-reported disability experienced by individuals with these two diagnoses co-occurring is higher than individuals with either diagnosis alone (Nichter et al., 2019a; 2019b). Moreover, individuals with various combinations of comorbid psychological diagnoses (i.e., PTSD and comorbid MDD; MDD and comorbid substance use disorders; MDD and comorbid GAD etc.) have been found to be challenging to treat and present significant barriers to effective recovery (Armenta et al., 2019; Kay-Lambkin et al., 2012; Kelly et al., 2012; Laudet et al., 2000; O'Neil & Kendall, 2012). These indications from previous research are significant as the degree of disability, the number of barriers and the effectiveness of treatment interventions impacts functional outcomes such as RTW (Gragano et al., 2018; Li-Tsang et al., 2007). Therefore, the poor RTW outcomes reported in our study's comorbid psychological diagnoses group are largely consistent with what we would expect based on the suggestions of related research.

This study examined RTW outcomes following a multidisciplinary treatment program. Previous research examining the use of multidisciplinary approaches to treat co-occurring physical and psychological injuries has demonstrated that they are more successful than other treatment approaches at facilitating RTW in this population (Berglund et al., 2018). However, to the author's knowledge, the RTW outcomes of individuals with comorbid psychological

conditions have not been examined following multidisciplinary treatment programs in a workers' compensation setting. Nevertheless, we would expect RTW outcomes in populations with comorbid psychological diagnoses to be better following a multidisciplinary rather than unidirectional treatment approach due to the ability of multidisciplinary programs to target barriers that typically impede RTW (Hoefsmit et al., 2012; Mikkelsen & Rosholm, 2018). For example, treatment from an occupational therapist as a part of a multidisciplinary team would typically aim to facilitate participation in work-related activities and has been found to positively impact RTW outcomes following a range of occupational injuries (Desiron et al., 2011; Soeker et al., 2021; Torchalla et al., 2019). Despite this, in the current study, RTW outcomes in individuals with comorbid psychological diagnoses were poor, with less than 35% of individuals with comorbid psychological diagnoses being successful in their RTW. However, the RTW rates of individuals with co-occurring psychological diagnoses have not been previously established in the literature; therefore, we can not evaluate if the RTW rate following this multidisciplinary intervention is higher or lower than we would expect. As such, it would be beneficial for future research to build off these findings and examine the effectiveness of different treatment approaches in facilitating RTW in individuals with comorbid psychological diagnoses to determine if the treatment approach implemented impacts RTW outcomes in this population. For example, future research could compare the RTW outcomes of a multidisciplinary treatment approach to a primarily psychotherapeutic treatment approach in this population.

We also found that interactions existed between psychological comorbidity and factors predictive of RTW. First, consistent with research that has extensively demonstrated that men and women experience and respond to mental health diagnoses differently, gender and psychological comorbidity were found to interact, resulting in men with comorbid psychological

diagnoses having more favourable RTW outcomes than women (Otten et al., 2021). Previous research has also demonstrated that women typically have a lower RTW rate than men (Cancelliere et al., 2016). In contrast, within the current study, the effect of gender was only observed in the comorbid psychological diagnoses group and was not observed for the whole sample. Therefore, contrary to previous research, gender was not a factor predictive of RTW outcome; however, it acted as a moderator between psychological comorbidity and RTW outcome. This finding suggests that psychological comorbidity has a more adverse impact on the RTW outcomes of females compared to males. Future research should further examine the interaction between gender and psychological comorbidity by examining the treatment of comorbid psychological conditions in various settings to determine if the interaction between gender and treatment outcome in this population exists outside of an RTW context.

Further, an interaction between employment as a PSP and factors predictive of RTW was also found. Specifically, PSP were significantly more likely to RTW if they did not have a self-reported history of exposure to traumatic events. This finding suggests that PSP who have been exposed to traumatic events and classify their exposure as such are at an increased risk of failure to RTW. As most PSP have been exposed to traumatic events, it is possible that how individuals conceptualize and view workplace trauma is different between those who did and did not report a history of trauma. Subsequently, these varying views on trauma might be what impacts RTW outcomes. In support of this idea, previous research suggests that in PSP, individual differences can influence how a traumatic event is interpreted and its subsequent impact on mental health and well-being (Ricciardelli et al., 2020). However, it is also possible that PSP who did not report a history of trauma have experienced fewer traumatic events than individuals with a self-reported history of trauma exposure. If this is the case, the worse RTW outcomes in PSP with a

self-reported trauma history are also consistent with what we would expect. Future research should examine if how PSP perceive and conceptualize traumatic experiences influences how they react and recover from PTSD.

Beyond psychological comorbidity, we identified additional predictive factors of RTW at program discharge in the final logistic regression model. Consistent with previous research examining RTW following injury, we found that increased readiness for RTW was significantly associated with more favourable RTW outcomes (Arends et al., 2019; Cancelliere et al., 2016; Gabbe et al., 2016). Further, confirming the claims of previous research, which indicates that an increased degree of trauma symptoms is a predictive factor of poor RTW outcomes, we found that elevated scores on the TSI-2 trauma factor were also predictive of failure to RTW in our study (Laisné et al., 2013). Finally, individuals with a primary physical ICD-9 diagnosis were found to have more favourable RTW outcomes than individuals with a primary psychological diagnosis. Consistent with this finding, recent research comparing RTW differences in individuals with musculoskeletal and psychological injuries found that individuals with psychological injuries have worse short-term RTW outcomes than individuals with musculoskeletal injuries (Smith et al., 2020). However, in our study and previous research, the severity of the physical injury was not controlled for; therefore, it is possible that injury severity influenced these results (i.e., individuals examined could have had only minor physical injuries). Future research could follow up on this by comparing RTW outcomes in individuals with physical and psychological injuries across different severities of physical injury. Overall, the factors identified as predictive of RTW outcome in this study were largely supported by related research.

4.2. Differences Between Workers with Single and Comorbid Psychological Diagnoses

In our study of injured workers admitted to WCB-Alberta's PTSD rehabilitation program, we found numerous differences in demographic, administrative and psychological variables between workers with single and comorbid psychological diagnoses. First, levels of depression, anxiety, and other psychological symptoms measured in the TSI-2 (i.e., defensive avoidance, hyperarousal, anger, reduced self-awareness, suicidal ideation, etc.) were all found to be higher in the comorbid psychological diagnoses group. These results help establish the accuracy of the comorbid diagnoses grouping by demonstrating that individuals within this group experienced a higher degree of adverse mental health symptoms than individuals with only one psychological diagnosis. This assertion is supported by the network model of psychological comorbidity, which suggests that a greater number of psychological symptoms is indicative of comorbid psychopathologies (Cramer et al., 2010). Further, previous research also supports the idea that individuals with comorbid psychological diagnoses present with more severe psychological symptoms (Momartin et al., 2004; Spinhoven et al., 2014).

To the author's knowledge, previous research has not compared workers with comorbid psychological diagnoses to individuals with a single trauma-related diagnosis in a workers rehabilitation setting. However, there are parallels that can be drawn from related research. For example, our finding that individuals with psychological comorbidities are more likely to be PSP is consistent with research suggesting PSP commonly report a high degree of psychological symptoms, consistent with multiple psychological diagnoses (Carleton et al., 2018). Furthermore, in our sample, both recent substance abuse issues and a history of traumatic experiences were also found to be more common in individuals with comorbid psychological conditions. Similarly, previous literature has established that both drug abuse and exposure to

traumatic events are associated with adverse psychological symptoms and an increased risk of psychological diagnoses (Garey et al., 2020; Sayed et al., 2015). Finally, our finding that assaults, violence, and exposure injuries were higher in the comorbid psychological diagnoses group is consistent with research that reports these incidents are highly correlated with the development of psychological symptoms and subsequent diagnoses (Gibson et al., 2017; Iverson et al., 2013). Overall, the results of the current study build upon the suggestions of previous research and indicate that factors such as substance abuse, exposure to trauma, and increased psychological symptom severity are commonly found in individuals with comorbid psychological diagnoses.

Individuals with comorbid psychological conditions also had a more extended period between accident and assessment. Although this finding has not been previously demonstrated in the empirical literature, it is theoretically supported by the network model of psychological comorbidity, which suggests that mental health symptoms, if left untreated, may cause the development of subsequent symptoms over time (Cramer et al., 2010). This could explain why psychological comorbidities are more likely in individuals who went an extended period before receiving treatment post-injury. Moreover, a longer delay between accident and assessment was also found in individuals who failed to RTW. Based on these findings, early identification and decreased delays between accident and admission to a treatment program appear to be critical in facilitating RTW and potentially reducing the risk of comorbid psychological conditions. As such, we suggest service providers aim to assess and subsequently admit workers' into treatment as soon as possible following workplace accidents. Further, efforts to encourage workers to report occupational accidents swiftly and streamline the accident to assessment process are

critical areas that workplaces and occupational rehabilitation providers should address in an attempt to improve RTW outcomes.

An alternative explanation for the higher frequency of individuals with comorbid psychological diagnoses when the accident to assessment times are longer could be that individuals with comorbid psychological diagnoses had underlying psychological conditions before their traumatic injury. Consequently, it is possible that having a severe elevation of psychological symptoms makes treatment-seeking more challenging, resulting in a longer accident to assessment period. However, pre-accident psychological history was inconsistently reported throughout claim files, so we could not confidently account for this in the current study. It is also possible that individuals with comorbid psychological diagnoses present a more complicated case file, and as such, it takes rehabilitation providers a more extended time to assess and admit them into rehabilitation programs. Future research could examine the adverse mental health effects associated with a delay in help-seeking behaviour to establish a more direct relationship between delayed help-seeking and psychological comorbidity. Further, future research should focus on collecting information on pre-accident mental health history to examine how mental health history influences the development of comorbid psychological conditions following a psychologically traumatic injury. Overall, the differences between the single and comorbid psychological diagnoses groups identified in this study revealed numerous novel findings while supporting the general indications of previous literature, which suggests increased psychological distress, impairment, and adverse mental health symptoms in individuals with psychological comorbidities (Panagioti et al., 2012; Raab et al., 2015; Roberts et al., 2015).

4.3. Limitations

One limitation of this study is that it utilized secondary analysis of archived data provided by WCB-Alberta, which may restrict its ability to be applied to other treatment contexts and outside of Alberta. However, the data were readily available and represented all workers with PTSD treated within the jurisdiction during the study period. Further, although only WCB-Alberta provided data, the claimant reports were provided by multiple treatment centers throughout the province, increasing the generalizability of the findings. Another limitation was that there was a considerable amount of missing data for the patient-reported outcome measures, with missing responses from 211 participants. Although there was a large amount of missing data, the sample size for the final regression model ($n=562$) was still larger than the calculated recommended sample size ($n=197$). Therefore, despite missing data, the analysis still had sufficient statistical power. However, data was also found not to be missing at random across numerous variables. As such, results should be interpreted with caution due to the differences between individuals with and without missing data.

Finally, the pre-accident psychological history of claimants was not accurately recorded in the WCB-Alberta reports and was not included in the data analysis process. Therefore, we can not conclude that the demographic, administrative and psychological factors identified are predictive of the development of comorbid psychological conditions, only that individuals with comorbid psychological diagnoses are more likely to present with those factors. However, as factors present in individuals with a trauma-related psychological diagnosis and concurrent psychological comorbidity have not been adequately studied in an RTW context, the current study provides a strong foundation for future research.

4.4. Conclusions

The current study provides evidence that having a comorbid psychological condition is significantly associated with failure to RTW after rehabilitation. Workers with single compared to comorbid psychological conditions also appear to take less time from injury to assessment, report a higher readiness to RTW, and spend less time on average in the rehabilitation program. In contrast, individuals with comorbid psychological conditions are more likely to have a history of trauma and substance abuse as well as higher ratings on depression, anxiety, and trauma scales. These findings are especially significant as the impact of psychological comorbidity has primarily been examined in other treatment contexts and has not focused on examining RTW as a treatment outcome. Future research with larger samples is needed to examine the influence of pre-existing psychological disorders and identify if some combinations of diagnoses impair RTW more than others.

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Appendix A
Traumatic Psychological Injury Program Care Model

Appendix A: Figure 1.

WCB-Alberta's Posttraumatic Psychological Injury Care Model

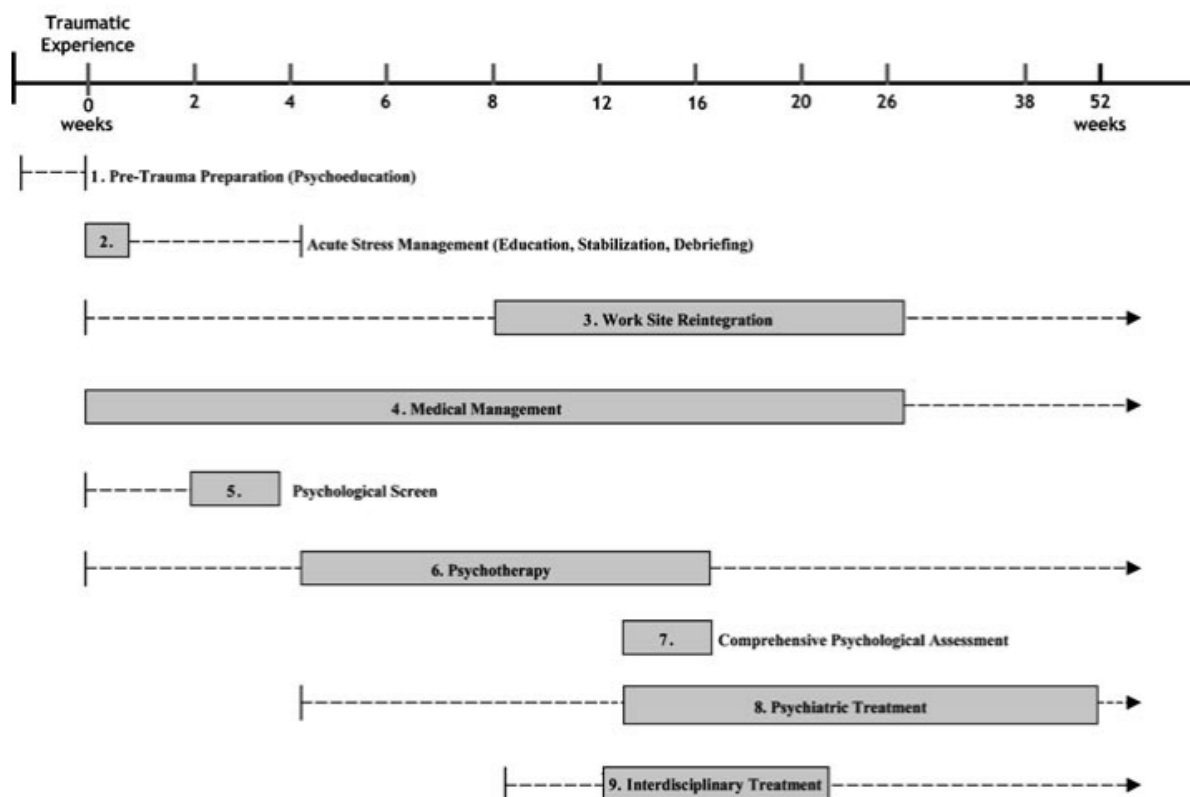


Figure taken from Rose, J. (2006). A model of care for managing traumatic psychological injury in a workers' compensation context. *Journal of Traumatic Stress, 19*, 315-326.

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Appendix B
Supplemental Tables

Appendix B: Table 1.

Breakdown of Beck Depression and Beck Anxiety Inventory Scores for RTW Versus Failure to RTW Groups

Full Sample	Return-to-work at Pre-accident Levels		p-value (Two-tailed) <i>t</i> or χ^2
	Yes RTW/FTW	No RTW/FTW	
Variable	Mean \pm SD <i>or</i> n (%)	Mean \pm SD <i>or</i> n (%)	
Beck Depression Inventory-II			p<0.001*
Minimal	39 (9.3%)	10 (2.8%)	
Mild	58 (13.8%)	33 (9.3%)	
Moderate	110 (26.3%)	93 (26.3%)	
Severe	202 (48.2%)	209 (59.2%)	
<i>Missing</i>	10 (2.4%)	8 (2.3%)	
Beck Anxiety Inventory			p<0.001*
Minimal	36 (8.6%)	12 (3.4%)	
Mild	85 (20.3%)	43 (12.2%)	
Moderate	118 (28.2%)	101 (28.6%)	
Severe	168 (40.1%)	186 (52.7%)	
<i>Missing</i>	12 (2.9%)	11 (3.1%)	

Appendix B: Table 2.

Breakdown of Workers With Comorbid Psychological Conditions Admitted to WCB-Alberta Traumatic Psychological Injury Rehabilitation Programs between the Years 2017-2019.

Psychological Diagnosis Type								p-Value (χ^2 test)
Trauma & Comorbid Depression Disorder (n=87)	Trauma & Comorbid Anxiety Disorder (n=19)	Trauma & Comorbid Personality Disorder (n=3)	Trauma & Comorbid Substance Use Disorder (n=8)	Trauma & Comorbid Somatoform Disorder (n=3)	Three Or More Comorbid Diagnosis (n=25)	Comorbid Diagnosis no Trauma (n=1)		
RTW Outcome at Program Discharge							p=0.36	
RTW/FTW	24 (27.6%)	10 (52.6%)	2 (66.7%)	3 (37.5%)	1 (33.3%)	9 (36.0%)	-	
No FTW	63 (72.4%)	9 (47.4%)	1 (33.3%)	5 (62.5%)	2 (66.7%)	16 (64.0%)	1 (100.0%)	

Appendix B: Table 3.

*Characteristics of Workers Successful and Unsuccessful in Return-to-work Admitted to the Workers Compensation Board of Alberta
Traumatic Psychological Injury Rehabilitation Programs between the Years 2017-2019*

Full Sample Variable	Return-to-work at Pre-accident Levels		p-value (Two-tailed) <i>t or χ^2</i>
	Yes RTW/FTW Mean \pm SD <i>or n (%)</i>	No RTW/FTW Mean \pm SD <i>or n (%)</i>	
Demographic/Administrative Variables	(n=419)	(n=353)	
Public Safety Personnel			p<0.001***
Yes	118 (28.2%)	139 (37.7%)	
Police	16	19	
Firefighter	9	11	
Paramedic/Ambulance Worker	59	52	
Correction Officer	28	53	
Firefighter & Paramedic	6	5	
No	300 (71.6%)	214 (60.6%)	
Missing	1 (0.2%)	-	
Age (in years; n=772)	42.6 (\pm 11.8)	41.4 (\pm 11.3)	0.14
Gender			0.36
Male	230 (54.9%)	182 (51.6%)	
Female	189 (45.1%)	171 (48.4%)	
Missing	-	-	
Education			0.35
Partial/Complete Highschool or Less	3 (0.7%)	7 (2.0%)	
High School Diploma	6 (1.4%)	1 (0.3%)	
Partial/Complete Technical School	67 (16.0%)	47 (13.3%)	
Partial/Complete University	40 (9.6%)	28 (7.9%)	
Not Specified	63 (15.0%)	64 (18.1%)	
High School not complete and no GED	20 (4.8%)	10 (2.8%)	
High School Diploma/GED	115 (27.4%)	109 (30.9%)	

Other Diploma/ Certificate	76 (18.1%)	60 (17.0%)	
Missing	29 (6.9%)	27 (7.6%)	
Occupational Category			0.004**
Management Occupations	24 (5.7%)	15 (4.2%)	
Business, Finance, & Administration Occupations	28 (6.7%)	23 (6.5%)	
Natural and Applied Sciences and Related Occupations	6 (1.4%)	4 (1.1%)	
Health Occupations	85 (20.3%)	68 (19.3%)	
Education, Law, Social & Community Government Services	79 (18.9%)	113 (32.0%)	
Occupations in Art, Culture, Recreation and Sport	4 (1.0%)	-	
Sales and Service Occupations	46 (11.0%)	26 (7.4%)	
Trades	132 (31.5%)	92 (26.1%)	
Natural Resources, Agriculture and Related Production Occupations	5 (1.2%)	7 (2.0%)	
Occupations in Manufacturing and Utilities	10 (2.3%)	5 (1.4%)	
Primary Nature of Injury			0.01*
Traumatic Injuries and Disorders	8 (1.9%)	3 (0.8%)	
Traumatic Injuries to Bones, Nerves, and Spina cord	19 (4.5%)	14 (4.0%)	
Traumatic Injuries to Muscles Tendons, Ligaments, Joints	48 (11.5%)	23 (6.5%)	
Open Wounds	12 (2.9%)	13 (3.7%)	
Surface Wounds and Bruises	21 (5.0%)	12 (3.4%)	
Burns	12 (2.9%)	2 (0.6%)	
Intracranial Injuries	23 (5.5%)	14 (4.0%)	
Multiple Traumatic Injuries and Disorders	5 (1.2%)	12 (3.4%)	
Other Traumatic Injuries and Disorders	19 (4.5%)	24 (6.8%)	
Nervous System and Sense Organs Disease	1 (0.2%)	-	
Mental Disorders or Syndromes	235 (56.1%)	232 (62.9%)	
Missing	16 (3.8%)	14 (4.0%)	

Type of Accident			0.09
Contact with Objects/Equipment	20 (4.8%)	19 (5.4%)	
Falls	12 (2.9%)	11 (3.1%)	
Bodily Reaction	44 (10.5%)	44 (12.5%)	
Exposure to Harm	138 (32.9%)	136 (38.5%)	
Transport Accidents	88 (21.0%)	42 (11.9%)	
Fire/Explosion	5 (1.2%)	4 (1.1%)	
Assault and Violence	109 (26.0%)	96 (27.2%)	
Other	2 (0.5%)	1 (0.3%)	
<i>Missing</i>	1 (0.2%)	1 (0.3%)	
Type of Injury			0.10
Traumatic/Physical Injury	181 (43.2%)	130 (36.8%)	
Psychological	236 (56.3%)	217 (61.5%)	
<i>Unknown</i>	2 (0.5%)	6 (1.7%)	
Primary ICD-9 Diagnosis			0.001***
Mental Health Condition	322 (76.8%)	312 (88.4%)	
Musculoskeletal Injury	95 (22.7%)	39 (11.0%)	
<i>Missing</i>	2 (0.5%)	2 (0.6%)	
Secondary ICD-9 Diagnosis			0.02*
Mental Health Condition	41 (9.5%)	41 (11.6%)	
Musculoskeletal Injury	81 (19.3%)	41 (11.6%)	
<i>Missing</i>	298 (71.1%)	271 (76.8%)	
Job Attached at Admission			0.44
Yes	382 (91.2%)	316 (89.5%)	
No	37 (8.8%)	37 (10.5%)	
Claim Related Issues			0.18
Yes	6 (1.4%)	14 (4.0%)	
No	140 (33.4%)	168 (47.5%)	
Missing	273 (65.2%)	171 (48.4%)	
Legal issues			0.43
Yes	11 (2.6%)	10 (2.8%)	
No	129 (30.8%)	167 (47.3%)	
Missing	279 (66.6%)	176 (49.9%)	

Number of treatment days missed on average (n=486)	5.7 (± 7.7)	6.4 (± 7.3)	0.30
Type of Rehabilitation Program admitted to (TPI Level at admission)			0.24
TPI Level 1	54 (12.9%)	33 (9.3%)	
TPI Level 2	217 (51.8%)	179 (50.7%)	
TPI Level 3	146 (34.8%)	136 (38.5%)	
Missing	2 (0.5%)	5 (1.4%)	
Average # of Previous Compensation Claims (n=772)	3.0 ^a	3.0 ^a	0.43 ^b
Anticipated Program Length (n=623)	39.9 (± 16.6)	36.5 (± 19.2)	0.02*
Period Between Accident and Assessment (n=769)	76.0 ^a	102.0 ^a	<0.001*** ^b
Psychological Variables			
Previous Trauma History			<0.001***
Yes	265 (63.2%)	275 (77.9%)	
No	154 (36.8%)	78 (22.1%)	
Substance Abuse			0.02*
Yes	72 (17.2%)	86 (24.4%)	
No	315 (75.2%)	243 (68.8%)	
Missing	32 (7.6%)	24 (6.8%)	
Suicide Risk			0.58
No risk	33 (7.9%)	42 (11.9%)	
Low Risk	102 (24.3%)	153 (43.3%)	
Medium/High Risk	11 (2.6%)	11 (3.1%)	
Missing	273 (65.2%)	147 (41.6%)	
Psychology Log¹			
Pain Intensity (n=627)	3.9 (± 2.9)	3.6 (± 2.7)	0.16
Stress (n=721)	6.8 (± 2.1)	7.31 (± 1.9)	<0.001***
Relaxation Skills (n=701)	4.3 (± 2.0)	3.9 (± 2.0)	0.006**
Energy Levels (n=718)	4.1 (± 2.0)	3.5 (± 1.9)	<0.001***
Sleep (hours/night) (n=718)	5.4 (± 1.7)	5.1 (± 1.8)	0.01*
Mood (n=719)	4.1 (± 1.9)	3.6 (± 1.8)	<0.001***
Readiness to RTW (n=728)	29.7% ($\pm 26.3\%$)	18.4% ($\pm 21.0\%$)	<0.001***
Psychometric Measures			

SF-36 Score²

Physical Functioning (<i>n</i> =103)	15.0 ^a	35.0 ^a	0.003 ^{b*}
Role Physical (<i>n</i> =101)	18.8 ^a	25.0 ^a	0.33 ^b
Bodily Pain (<i>n</i> =87)	62.6 (±29.3)	64.4 (±33.3)	0.82
General Health (<i>n</i> =122)	38.9 (±19.1)	37.0 (±25.0)	0.69
Vitality (<i>n</i> =130)	41.0 (±15.5)	41.3 (±14.1)	0.92
Social Functioning (<i>n</i> =118)	36.5 (±24.8)	37.5 (±21.5)	0.87
Role Emotional (<i>n</i> =84)	28.0 (±27.0)	38.2 (±28.7)	0.17
Mental Health (<i>n</i> =128)	42.8 (±13.3)	39.6 (±11.8)	0.26
Beck Depression Inventory-II			<0.001***
Minimal/Mild	97 (23.2%)	43 (12.2%)	
Moderate/Severe	312 (74.5%)	302 (85.6%)	
Missing	10 (2.4%)	8 (2.3%)	
Beck Anxiety Inventory			<0.001***
Minimal/Mild	121 (28.9%)	55 (15.6%)	
Moderate/Severe	286 (68.3%)	287 (81.3%)	
Missing	12 (2.9%)	11 (3.1%)	
TSI-2 Factor Scores			
Trauma (TR)			<0.001***
Not indicated as Significant	170 (40.6%)	89 (25.2%)	
Elevated	154 (36.8%)	207 (58.6%)	
Missing	95 (22.7%)	57 (16.1%)	
Self-Disturbance (SE)			<0.001***
Not indicated as Significant	267 (63.7%)	201 (56.9%)	
Elevated	58 (13.8%)	95 (26.9%)	
Missing	94 (22.4%)	57 (16.1%)	
Externalization (EX)			0.006**
Not indicated as Significant	278 (66.3%)	228 (64.6%)	
Elevated	47 (11.2%)	68 (19.3%)	
Missing	94 (22.4%)	57 (16.1%)	
Somatization (SO)			0.004**
Not indicated as Significant	289 (69.0%)	239 (67.7%)	
Elevated	36 (8.6%)	57 (16.1%)	

<i>Missing</i>	94 (22.4%)	57 (16.1%)	
<i>TSI-2 Subscale Scores</i>			
TR – Dissociation			<0.001***
Not indicated as Significant	237 (56.6%)	167 (47.3%)	
Elevated	87 (20.8%)	129 (36.5%)	
<i>Missing</i>	95 (22.7%)	57 (16.1%)	
TR – Relational Avoidance			0.02*
Not indicated as Significant	292 (69.7%)	247 (70.0%)	
Elevated	33 (7.9%)	48 (13.6%)	
<i>Missing</i>	94 (22.4%)	58 (16.4%)	
TR- Defensive Avoidance			<0.001***
Not indicated as Significant	211 (50.4%)	144 (40.8%)	
Elevated	114 (27.2%)	152 (43.1%)	
<i>Missing</i>	94 (22.4%)	57 (16.1%)	
TR – Intrusive experiences			<0.001***
Not indicated as Significant	141 (33.7%)	75 (21.1%)	
Elevated	184 (43.9%)	221 (62.6%)	
<i>Missing</i>	94 (22.4%)	57 (16.1%)	
TR- Anxious Arousal			0.41
Not indicated as Significant	249 (59.4%)	235 (66.6%)	
Elevated	76 (18.1%)	61 (17.3%)	
<i>Missing</i>	94 (22.4%)	57 (16.1%)	
TR – Hyperarousal			0.003**
Not indicated as Significant	177 (42.2%)	126 (35.7%)	
Elevated	148 (35.3%)	170 (48.2%)	
<i>Missing</i>	94 (22.4%)	57 (16.1%)	
SE – Depression			<0.001***
Not indicated as Significant	222 (53.0%)	152 (43.1%)	
Elevated	103 (24.6%)	144 (40.8%)	
<i>Missing</i>	94 (22.4%)	57 (16.1%)	
SE - Anxiety			<0.001***
Not indicated as Significant	210 (50.1%)	151 (42.8%)	
Elevated	115 (27.4%)	145 (41.1%)	

<i>Missing</i>	94 (22.4%)	57 (16.1%)	
SE – Insecurity			0.48
Not indicated as Significant	291 (69.5%)	270 (76.5%)	
Elevated	37 (8.8%)	29 (8.2%)	
<i>Missing</i>	94 (22.4%)	57 (16.1%)	
SE – Self-Reference			0.68
Not indicated as Significant	293 (69.9%)	263 (74.5%)	
Elevated	32 (7.6%)	32 (9.1%)	
<i>Missing</i>	94 (22.4%)	58 (16.4%)	
SE – Self Awareness			0.03*
Not indicated as Significant	284 (67.8%)	239 (67.7%)	
Elevated	41 (9.8%)	56 (15.9%)	
<i>Missing</i>	94 (22.4%)	58 (16.4%)	
EX – Anger			<0.001***
Not indicated as Significant	236 (56.3%)	177 (50.1%)	
Elevated	89 (21.2%)	119 (33.7%)	
<i>Missing</i>	94 (22.4%)	57 (16.1%)	
EX – Tension Reduction			0.02*
Not indicated as Significant	270 (64.4%)	225 (63.7%)	
Elevated	54 (12.9%)	72 (20.4%)	
<i>Missing</i>	95 (22.7%)	56 (15.9%)	
EX – Sex Disturbance			0.60
Not indicated as Significant	302 (72.1%)	278 (78.8%)	
Elevated	22 (5.3%)	17 (4.8%)	
<i>Missing</i>	95 (22.7%)	58 (16.4%)	
EX – Suicidal Behaviour			0.64
Not indicated as Significant	294 (70.2%)	271 (76.8%)	
Elevated	31 (7.4%)	25 (7.1%)	
<i>Missing</i>	94 (22.4%)	57 (16.1%)	
EX – Suicidal Ideation			0.14
Not indicated as Significant	274 (65.4%)	236 (66.9%)	
Elevated	51 (12.2%)	60 (17.0%)	
<i>Missing</i>	94 (22.4%)	57 (16.1%)	

SO – Somatic Pain			0.52
Not indicated as Significant	304 (72.6%)	272 (77.1%)	
Elevated	21 (5.0%)	23 (6.5%)	
Missing	94 (22.4%)	58 (16.4%)	
SO – Somatic General			0.99
Not indicated as Significant	278 (66.3%)	253 (71.7%)	
Elevated	46 (11.0%)	42 (11.9%)	
Missing	94 (22.7%)	58 (16.4%)	

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

RTW = Return-to-work; FTW = Fit-to-work; SF-36 = 36-item Short Form Health Survey; TSI-2 = Trauma Symptom Inventory-2; TR = TSI-2 Traumatic Factor Scale; SE = TSI-2 Self-Disturbance Factor Scale; EX = TSI-2 Externalization Factor Scale; SO = TSI-2 Somatization Factor Scale.

¹ Psychology Log subscale scores are expressed as an integer ranging between 0 and 10, except for 'Sleep,' which represents average hours of sleep per night, and 'Readiness to RTW,' which is displayed as a percentage from 0 to 100.

² SF-36 scores are expressed as an integer from 0 to 100, with lower scores representing a higher degree of disability.

^a Indicates that median was used instead of mean due to normality concerns.

^b P-value represents the significance level from the Kruskal-Wallis test.

Appendix B: Table 4.

Logistic Regression Analysis Examining Factors Influencing Return-to-Work and Failure to Return-to-Work as a Function of Gender

(*n*=562)

	Adjusted Odds Ratio (95% Confidence Interval)		Adjusted Odds Ratio (95% Confidence Interval)	
	Males	p-value	Females	p-value
Full Model				
Demographic and Administrative variables				
Psychological Comorbidity ^a				
Single Diagnosis	1.31 (0.69 – 2.48)	0.40	3.49 (1.59 – 7.69)	0.002*
Age	1.01 (0.98 – 1.03)	0.55	1.01 (0.99 – 1.04)	0.41
Occupation				
Other (e.g., Management, applied sciences, sales and services, manufacturing, business, finance, and administration etc.)	1.0		1.0	
Trades ^a	0.48 (0.27 – 0.86)	0.01*	1.12 (0.58 – 2.18)	0.74
Education, Law, Social and Community in Government (Including Public Safety Personnel) ^a	0.26 (0.13 – 0.53)	<0.001***	0.92 (0.48 – 1.74)	0.79
Exposure to Trauma				
Yes	0.92 (0.52 – 1.62)	0.76	0.49 (0.25 – 0.95)	0.04*
Primary ICD Diagnosis				
Physical	1.45 (0.74 – 2.86)	0.28	2.95 (1.24 – 7.01)	0.01*
Psychological/Psychometric Variables				
BAI				
Minimal/Mild	1.34 (0.71 – 2.52)	0.37	1.43 (0.72 – 2.84)	0.31
Moderate/Severe	1.0		1.0	
TSI-2 Trauma				
Non-Clinical/Not Indicated	1.96 (1.13 – 3.42)	0.02*	1.57 (0.89 – 2.76)	0.12
Clinical	1.0		1.0	

Readiness to Return-to-Work	1.33 (1.17 – 1.51)	<0.001*	1.18 (1.05 – 1.32)	0.004*
Nagelkerke R Square value	0.249		0.212	

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

^a represents a significant difference in the variable between males and females

TSI-2 = Trauma Symptom Inventory-2; BAI = Beck's Anxiety Inventory

Appendix B: Table 5.

Logistic Regression Analysis Examining Factors Influencing Return-to-Work and Failure to Return-to-Work Comparing Public Safety

Personnel and Non-Public Safety Personnel (n=562)

	Adjusted Odds Ratio (95% Confidence Interval) Public Safety Personnel	p-value	Adjusted Odds Ratio (95% Confidence Interval) Non-Public Safety Personnel	p-value
Full Model				
Demographic and Administrative variables				
Psychological Comorbidity				
Single Diagnosis	1.26 (0.60 – 2.62)	0.54	3.04 (1.60 – 5.76)	<0.001*
Age	1.02 (0.98 – 1.05)	0.36	1.00 (0.99 – 1.02)	0.69
Gender				
Male	1.50 (0.77 – 2.94)	0.24	1.07 (0.66 – 1.75)	0.78
Exposure to Trauma ^a				
Yes	0.21 (0.07 – 0.62)	0.01*	0.93 (0.57 – 1.52)	0.77
Primary ICD Diagnosis				
Physical	2.85 (0.48 – 17.00)	0.25	1.77 (1.02 – 3.09)	0.04*
Psychological/Psychometric Variables				
BAI				
Minimal/Mild	1.43 (0.69 – 2.97)	0.33	1.64 (0.89 – 3.02)	0.11
Moderate/Severe	1.0		1.0	
TSI-2 Trauma				
Non-Clinical/Not Indicated	1.68 (0.87 – 3.24)	0.12	1.75 (1.08 – 2.84)	0.02*
Clinical	1.0		1.0	
Readiness to Return-to-Work	1.29 (1.12 – 1.47)	<0.001*	1.19 (1.07 – 1.32)	0.001**
Nagelkerke R Square value	0.293		0.226	

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

^a represents a significant difference in the variable between Public Safety Personnel and non-Public Safety Personnel.

TSI-2 = Trauma Symptom Inventory-2; BAI = Beck's Anxiety Inventory.

Appendix B: Table 6.

Logistic Regression Analysis Examining Factors Influencing Return-to-Work and Failure to Return-to-Work Comparing Individuals with single and Comorbid Diagnoses (n=562)

	Adjusted Odds Ratio (95% Confidence Interval) Single Diagnosis	p-value	Adjusted Odds Ratio (95% Confidence Interval) Comorbid Diagnosis	p-value
Full Model				
Demographic and Administrative variables				
Gender				
Male ^a	0.95 (0.62 – 1.46)	0.83	3.04 (1.07 – 8.66)	0.04*
Age				
	1.01 (0.99 – 1.03)	0.48	0.98 (0.94 – 1.02)	0.29
Occupation				
Other (e.g., Management, applied sciences, sales and services, manufacturing, business, finance, and administration etc.)	1.0		1.0	
Trades ^a	0.90 (0.54 – 1.49)	0.67	0.14 (0.04 – 0.54)	0.004**
Education, Law, Social and Community in Government (Including Public Safety Personnel)	0.49 (0.29 – 0.84)	0.009**	0.32 (0.10 – 1.06)	0.06
Exposure to Trauma				
Yes	0.92 (0.54 – 1.58)	0.77	0.49 (0.13 – 1.86)	0.29
Primary ICD Diagnosis				
Physical	2.23 (1.24 – 4.03)	0.008**	1.40 (0.26 – 7.54)	0.70
Psychological/Psychometric Variables				
BAI				
Minimal/Mild	1.43 (0.86 – 2.38)	0.17	4.13 (1.02 – 16.82)	0.05*
Moderate/Severe	1.0		1.0	
TSI-2 Trauma				
Non-Clinical/Not Indicated	1.81 (1.17 – 2.81)	0.008**	1.11 (0.34 – 3.69)	0.86
Clinical	1.0		1.0	

Readiness to Return-to-Work	1.27 (1.15 – 1.40)	< 0.001***	1.17 (0.93 – 1.48)	0.18
Nagelkerke R Square value	0.19		0.30	

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

^a represents a significant difference in the variable between individuals with single versus comorbid psychological diagnoses.

TSI-2 = Trauma Symptom Inventory-2; BAI = Beck's Anxiety Inventory