



THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

Research Commons

<https://researchcommons.waikato.ac.nz/>

Research Commons at the University of Waikato

Copyright Statement:

The digital copy of this thesis is protected by the Copyright Act 1994 (New Zealand).

The thesis may be consulted by you, provided you comply with the provisions of the Act and the following conditions of use:

- Any use you make of these documents or images must be for research or private study purposes only, and you may not make them available to any other person.
- Authors control the copyright of their thesis. You will recognise the author's right to be identified as the author of the thesis, and due acknowledgement will be made to the author where appropriate.
- You will obtain the author's permission before publishing any material from the thesis.

**Network of Mindfulness and Difficulties in Regulating Emotions in
Firefighters**

A thesis

submitted in fulfilment

of the requirements for the degree

of

Master of Applied Psychology in Behaviour Analysis in Psychology

at

The University of Waikato

by

Hui Ning Chiang



THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

2024

Abstract

Growing evidence supports the role of mindfulness in regulating emotions in the general population. However, the interactive network of mindfulness facets and difficulties in regulating emotions is not well understood, which is specifically important for individuals involved in high-risk professions, such as first responders. The aim of this study was to investigate the interactive relations between mindfulness facets, acting with awareness, non-judging, describing, observing, and non-reacting, ability to regulate emotions and alcohol use in firefighters sample including military veterans. A sample of 685 career firefighters including 154 (22.5%) of military veterans, who completed measures of mindfulness and difficulties in regulating emotions was subjected to network analysis. Through network analysis, it was found that mindfulness facet non-judging was negatively related to emotion regulation challenges, such as nonaccepting attitudes and lack of clarity, and positively related to deficits in goal-directed behaviour. Acting with awareness, was negatively related to goal-directed behaviour deficits and impulsivity. Alcohol use was positively linked to impulsivity and negatively linked to describing facet of mindfulness. Overall, emotion regulation difficulties were positively linked together, and positive links were found between most mindfulness facets. Directed network analysis identified non-judging and emotion regulation strategy as parental predictors. Non-judging appeared as a protective factor, supporting other mindfulness facets, while lack of emotion regulation strategies exacerbated emotion regulation challenges as a risk factor. This network analysis demonstrated the significance of acting with awareness and a non-judgmental attitude facet of mindfulness, in fostering better emotion regulation and potentially playing a protective role against impulsivity and alcohol use in firefighters.

Acknowledgments

I wish to extend my sincere appreciation to Dr. Oleg Medvedev for his guidance throughout this thesis, his invaluable support throughout my academic journey, and his contribution to my overall psychological well-being.

Furthermore, I would like to express my gratitude to my dear family and friends whose unwavering support has been instrumental throughout my academic pursuits.

Additionally, I am deeply thankful to Dr. Anka A. Vujanovic, a licensed clinical psychologist and a Research Professor in the Department of Psychology at the University of Houston, for kindly providing her dataset for this research. Her generosity and collaboration have significantly enriched the quality and scope of this study.

Table of Contents

Abstract.....	ii
Acknowledgments.....	iii
Table of Contents.....	iv
Lists of Tables.....	vi
Lists of Figures	vii
Introduction.....	1
Method	13
Participants.....	13
Procedure.....	14
Measures.....	15
Demographic questionnaire.....	15
Five Facet Mindfulness Questionnaire (FFMQ).	15
Difficulties in Emotion Regulation Scale - 16 item version (DERS-16).	15
Alcohol Use Disorders Identification Test (AUDIT).	16
Data Analyses.....	16
Comparison of Network Modelling Methodologies	21
Results.....	23
Discussion.....	38
Limitations and Directions for Future Research	50
References.....	54
Appendix A (Divisional Ethics Approval)	72

Appendix B (IRB Ethics Approval).....	73
Appendix C (FFMQ)	75
Appendix D (DERS).....	78
Appendix E (DERS-16).....	79
Appendix F (AUDIT)	81

Lists of Tables

Table	Title	Page
1	Descriptive statistics for participant demographics.	14
2	Descriptive statistics of FFMQ, DERS, alcohol use, and age.	24
3	Partial correlation matrix controlling for age.	27
4	Estimated posterior means, standard deviations, credible lower and upper bound.	31
5	Posterior correlation matrix for nondirectional network.	33
6	Strength and direction estimates for directional network.	37

Lists of Figures

Figure	Title	Page
1	Network analysis of five mindfulness facets, five aspects of difficulties in regulating emotion, alcohol, and other factors.	29
2	Directional graph of relationships between five mindfulness facets, five aspects of difficulties in regulating emotion, alcohol, and other factors.	35
3	Predictability plot for each variable in the network analysis.	38

Introduction

The demanding nature of firefighting involves prolonged exposure to various traumatic and chronically stressful situations. Hence, firefighters face a higher susceptibility to mental health issues, including posttraumatic stress disorder (PTSD), depression, generalized anxiety, and substance use disorders (SUD). Numerous studies consistently highlight their increased vulnerability to developing PTSD compared to individuals in other professions (Leonard & Vujanovic, 2022; Stanley et al., 2019; Sun et al., 2020). Firefighters may also experience burnout (Makara-Studzińska et al., 2019), hazardous substance use or SUD (Miloslavich et al., 2023), and suicidal ideation (Park et al., 2019). Based on the stress sensitization theory, individuals who have previously experienced significant stress or adversity are more reactive to stressors and have increased vulnerability (Hammen et al., 2000; Post, 1992; Smid et al., 2012). Hence, firefighters who have prior military service and have encountered potentially traumatic events during their military tenure may exhibit heightened vulnerability to these psychological challenges (Bartlett et al., 2018). Considering the frequent exposure to potentially traumatizing experiences inherent in firefighting and the elevated prevalence of mental health issues among firefighters, it is crucial to prioritize the development of specialized programs. These programs should be tailored specifically to promote the mental well-being of firefighters and prevent the emergence of symptoms and maladaptive coping mechanisms, such as excessive alcohol consumption, within this at-risk population.

Given the challenging nature of firefighting and the heightened risk of emotion dysregulation among firefighters, understanding, and implementing effective emotion regulation strategies is crucial for maintaining mental well-being and ensuring optimal performance in high-stress situations for this population. Emotion regulation encompasses the capacity to recognize, govern, and navigate one's emotions effectively, employing adaptive

techniques to regulate and comprehend both positive and negative emotional experiences (Bjureberg et al., 2016; Bradizza et al., 2018). The process model of emotion regulation proposed by Gross (2015) provides a framework for understanding how individuals influence their emotions, emphasizing the role of antecedent-focused strategies (e.g., reappraisal) and response-focused strategies (e.g., suppression) in managing emotional experiences.

Firefighters often encounter traumatic situations that can trigger intense emotions, they may perceive their emotions as uncontrollable and threatening which potentially leading to difficulties in emotion regulation. This perception can heighten their fear of trauma cues, leading to avoidance of reminders that could cause distress. Moreover, firefighters who struggle with emotion regulation are at a higher risk of engaging in harmful coping mechanisms, including avoidance, substance abuse, and other risky behaviours (Raudales et al., 2019).

Therefore, Difficulties in Emotion Regulation Scale (DERS) was developed to serve as a crucial instrument for assessing and comprehending deficits in emotion regulation (Gratz & Roemer, 2004). This instrument builds upon Linehan's (1993) theoretical framework, emphasizing the interconnectedness of Borderline Personality Disorder (BPD), emotion dysregulation, and deliberate self-harm. While it initially had ties to BPD, the DERS has grown into a versatile instrument applicable in various situations, contributing to the examination and understanding of emotion regulation. The DERS has been used in diverse contexts, including studies on adolescence and adults regarding identity development, procrastination, social participation, academic motivation and performance, and psychophysiological responses, highlighting its broad applicability and relevance to the current study (Gori et al., 2022; Haag et al., 2023; Kaufman et al., 2015; Kökönyei et al., 2014; Saritaş-Atalar et al., 2015; Weiss et al., 2022). Other scales, such as the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) and the Cognitive Emotion Regulation

Questionnaire (CERQ; Garnefski & Kraaij, 2007), also measure emotion regulation, but DERS provides a comprehensive assessment of multiple facets of emotion regulation, making it particularly useful for this research.

By examining these deficits, emotion regulation can be conceptualized as encompassing five core facets. This includes the ability to (a) recognize and grasp emotions, (b) acknowledge and validate emotional experiences, (c) effectively handle impulsive behaviours, (d) align actions with desired goals, especially in the face of negative emotions, and (e) intelligently use suitable emotion regulation strategies to adjust emotional responses based on personal goals and the demands of the situation. Through exploring these components, researchers can pave the way for developing effective interventions that involve effective treatment approaches such as mindfulness.

Mindfulness has captured considerable interest among researchers as they reveal its potential advantages for general well-being and psychological aspects of human experience. Mindfulness is generally described as an awareness that emerges through consciously attending to the present moment, without passing judgment on one's internal experiences, including thoughts, emotions, impulses, and physical sensations (Kabat-Zinn, 1990; Kabat-Zinn, 1994). The Mindfulness-to-Meaning Theory (MMT; Garland et al., 2015) suggests that mindfulness practice allows one to decentre from stress appraisals into a metacognitive state of awareness, resulting in broadened attention to novel information that accommodates a reappraisal of life circumstances, which are crucial for psychological resilience and well-being. Desrosiers et al. (2013) assert that by adopting an observing and non-judgmental approach, individuals can disengage from negative self-monitoring and avoid rumination, thereby preventing negative self-talk and fostering a focus on the present moment without reactive responses. Numerous studies consistently demonstrated the positive influence of mindfulness on firefighters. Firefighters who incorporate mindfulness in their daily routines

tend to experience lower levels of PTSD, depression, suicidal thoughts and alcohol use issues (Smith et al., 2011; Stanley et al., 2019). Krägeloh et al. (2019) also highlighted the effectiveness of mindfulness-based interventions in reducing PTSD, depression and alcohol use disorder in various populations. For instance, military veterans who received mindfulness-based interventions reported improvements in their mental health, including their quality of life (Smith et al., 2011). Military personnel who have undergone mindfulness-based interventions before combat training reported a decrease in stress biomarkers compared to other traditional training methods (Vujanovic et al., 2022).

To date, the Five Facet Mindfulness Questionnaire (FFMQ), developed by Baer et al. (2006), is the most widely used validated scale used in mindfulness research (Bartos et al., 2023; Lecuona et al., 2022; Okafor et al., 2023). It comprises of five key facets, including acting with awareness, non-judging, describing, observing, and non-reacting. Acting with awareness involves intentionally and fully attending to present-moment activities and experiences; describing involves using language to articulate and verbally express the nature of one's experiences.; observing involves being attentive and aware of both internal and external experiences without attachment or reactivity; non-reacting involves acknowledging thoughts and emotions without getting caught up in them, and non-judging involves having an accepting and non-evaluative attitude towards thoughts and emotions (Baer et al., 2006). The five facets of mindfulness were initially aligned with the module of the Dialectical Behaviour Therapy (DBT) developed by Linehan (1993), which incorporates the relevant mindfulness-based techniques. The Five Facet Mindfulness Questionnaire's alignment with the modules of Dialectical Behaviour Therapy (DBT) is significant as it reflects the integration of mindfulness-based techniques within DBT, emphasizing the cultivation of awareness, non-judgment, and non-reactivity—core elements that enhance the therapeutic

effectiveness of Linehan's (1993) comprehensive approach to addressing emotional dysregulation and complex mental health issues.

Between the beginning of 2022 and early 2023, over 100 published studies utilized the FFMQ as a tool to measure mindfulness (Gan et al., 2023; Ketay et al., 2023; Kümmerle et al., 2023). These studies have provided insights into the distinct impacts of various mindfulness components on psychological well-being. For instance, Azizi et al. (2022) found that all mindfulness facets, except for observing, had distinct and significant relationships with psychological symptoms. Specifically, acting with awareness was the most strongly associated with negative affect, followed by non-judging and describing. Similarly, McBride et al. (2022) discovered that among college students, all aspects of trait mindfulness, except for observing, were related to lower levels of physical symptoms of stress, which was mediated by a decrease in perceived stress.

Mindfulness is instrumental in addressing emotion regulation difficulties, as outlined in the DERS. It is particularly beneficial for firefighters in fostering acceptance of emotional responses. This approach, as advocated by Lutz et al. (2014) and Iani et al. (2018), allows for acknowledging and understanding emotions without unnecessary self-criticism, building mental and emotional strength in the face of adversity. By encouraging the cultivation of a detached and non-judgmental attitude towards thoughts and emotions, as emphasized by Garland et al. (2015) and Lindsay & Creswell (2017), mindfulness enables firefighters, to gain a refreshed perspective. The process model of emotion regulation (Gross, 2015) further supports this idea by illustrating how both antecedent-focused strategies, cognitive reappraisal and response-focused strategies allows individuals to manage their emotional experiences. Based on this theoretical framework, it is hypothesized that the mindfulness facets including ability to act with awareness, non-reacting, non-judging and observe without judgment aligns are negatively associated with emotion nonacceptance, which align with the

antecedent-focused strategies. For instance, acting with awareness involves fully attending to present-moment activities, which can prevent the automatic negative thought patterns that contribute to emotion nonacceptance. Observing without judgment allows for a non-reactive stance towards internal experiences, fostering a greater sense of control over emotional responses, allowing for greater control over emotional responses (Gross, 2015). This approach is essential for breaking free from negative self-monitoring and preventing rumination, promoting a proactive and constructive mindset. Rather than berating themselves for certain emotions, firefighters learn to acknowledge and accept them, which, over time, strengthens their psychological fortitude. Mindfulness becomes a valuable tool, offering firefighters a more balanced and compassionate relationship with their emotions in the demanding context of their profession.

In demanding and dynamic situations, mindfulness facilitates a focused and purposeful approach to goal-directed tasks, unveiling its potential as a transformative tool for improved decision-making and performance. One of the core mindfulness facets, acting with awareness, is particularly relevant in this context. The MMT (Garland et al., 2015) emphasised that mindfulness enhances cognitive flexibility and goal-directed behaviour by broadening attention and promoting adaptive reappraisal. Vago & Silbersweig (2012) also noted that mindfulness enables firefighters to navigate their emotional responses effectively, resulting in a more focused and efficient engagement in goal-directed behaviours. By cultivating this mindfulness practice, firefighters gain not only mental clarity and resilience but also a refined ability to interpret and manage their emotions. This ensures more efficient and effective engagement in tasks with specific objectives. Essentially, mindfulness acts as a transformative tool, elevating overall cognitive and emotional capabilities for optimal performance in the challenging landscape of their profession. Hence it is hypothesized that acting with awareness is positively related to goal-oriented behaviours, as it enhances

firefighters' ability to stay focused on their goals and perform their tasks effectively under pressure.

Additionally, mindfulness practices play a pivotal role in promoting enhanced emotion regulation, specifically in gaining better control over impulsive reactions, as described by Roemer et al. (2015). Firefighters are usually required to stay calm and make thoughtful decisions in intense situations, therefore having a heightened awareness and control through mindfulness is crucial. Mindfulness equips them with a pause button for their minds, to take a quick breath, assess the situation, choose the best way to respond, and ultimately contribute to overall mental resilience. This ability is particularly relevant for firefighters, helping them navigate intense situations with increased awareness and control.

Besides, firefighters benefit significantly from mindfulness as it provides them with access to a broader array of emotion regulation strategies. In the demanding environments they operate within, firefighters find particular value in mindfulness, which allows them to reappraise cognitive processes (Wimmer et al., 2019). Through mindfulness practices, firefighters develop the ability to reassess challenging situations differently, thereby changing the emotional impact of those situations. This cognitive reappraisal, coupled with the other emotion regulation strategies gained through mindfulness, equips firefighters with the tools needed for emotional resilience and adaptive responses in the face of challenging circumstances.

Mindfulness proves exceptionally beneficial for firefighters by addressing challenges related to emotional clarity. According to insights from Guendelman et al. (2017), mindfulness empowers firefighters to not only observe but also describe their internal emotional states. This process contributes significantly to enhancing emotional clarity, granting firefighters a better understanding of the transient nature of emotions. In practical terms, it means that by practicing mindfulness, firefighters gain a clearer awareness of how

they feel inside during intense situations. This heightened emotional clarity serves as a valuable tool, allowing them to recognize that emotions come and go, fostering a more composed and effective response in the face of the complex and emotionally charged scenarios. Specifically, the non-judging and describing facets of mindfulness are key to this process. Based on the study by Gu, Strauss, Bond, and Cavanagh (2015), adopting a nonjudgmental, observer view through mindfulness-based stress reduction (MBSR) can enhance emotional clarity by helping individuals identify specific emotions more clearly in each moment. Therefore, through observing one's emotions without judgment and accurately describing them, firefighters can reduce difficulties in emotional clarity, supporting this research's prediction that these facets are negatively associated with such difficulties.

The Monitor and Acceptance Theory (MAT), as proposed by Lindsay and Creswell in 2017, provides a valuable framework for improving emotion regulation through two fundamental mindfulness skills: attention monitoring and acceptance. MAT suggests that by mindfully observing emotions and accepting them without judgment, individuals can cultivate a compassionate and adaptable approach to their emotional experiences. According to Schuman-Olivier and colleagues (2020), MAT's relevance lies in its dual focus on attention and acceptance, which addresses both the recognition and the non-reactivity to emotions. This is particularly beneficial for firefighters, who often face intense and potentially traumatic situations that require both acute awareness and emotional resilience. By honing their ability to monitor their emotional states and accept them without judgement, firefighters can better manage stress and maintain psychological well-being.

Despite its benefits, MAT has faced criticism, particularly regarding the lack of consistent measurement tools for monitoring and acceptance mindfulness skills. Critics like Simione and Saldarini (2023) argue that there is limited evidence supporting a direct impact of monitoring on psychological symptoms and well-being. The authors further concluded that

while MAT provides a promising framework, it requires more rigorous and comprehensive testing to address these issues and solidify its standing within the broader field of mindfulness research.

However, the MAT framework remains useful for several reasons. First, it integrates well with existing evidence on the benefits of mindfulness, particularly in high-stress professions like firefighting. Studies have shown that mindfulness practices, which include elements of attention monitoring and acceptance, can significantly reduce symptoms of PTSD, depression, and anxiety (Smith et al., 2011; Stanley et al., 2019). This alignment suggests that the principles underlying MAT are already contributing to positive outcomes in related contexts. Furthermore, the MAT framework provides a structured approach to understanding how mindfulness can be operationalized to enhance emotion regulation. This is because the framework helps individuals maintain a balanced emotional state, which is essential for optimal cognitive functioning (Lindsay & Creswell, 2019). It offers clear, actionable strategies that can be implemented in training programs for firefighters, making it a practical tool for intervention design. This practicality is crucial for developing effective, targeted programs that address the specific needs of this population. Therefore, the present study acknowledges MAT as a relevant framework and aims to explore the interplay between mindfulness and emotion regulation, considering MAT as a theoretical basis for investigation.

Building upon the comprehensive benefits of mindfulness discussed earlier, its role in addressing emotional challenges extends to offering a constructive alternative to coping mechanisms, such as alcohol abuse, prevalent among firefighters (Haddock et al., 2022; Lebeaut et al., 2020; Zegel et al., 2019). Regular exposure to potentially traumatic events often leads some firefighters to turn to alcohol to navigate psychological distress, but this practice carries substantial risks in terms of regulating emotions and controlling behaviour

(Stappenbeck & Fromme, 2014). In contrast, the established effectiveness of mindfulness-based interventions in addressing substance use disorders, along with research demonstrating that dispositional mindfulness serves as a protective factor against alcohol use in healthcare workers (Barré et al., 2022). These findings led to the prediction of alcohol use is positively related to impulsivity and negatively related to emotional clarity, highlighting the potential of mindfulness as a valuable tool for cultivating healthier coping strategies within the firefighting community.

The recent scholarships indicate complex relationships between emotion regulation and different facets of mindfulness, especially when considering the influence of alcohol (Wisener & Khoury, 2019; Wisener & Khoury, 2020). However, the exact nature of these interactive relations is not well understood due to methodological limitations in previous studies, such as moderation, mediation, and correlation analyses. Such analyses can be useful to investigate hypothesized relationships between variables of interest, but they are inherently limited due to arbitrary assigning predictor, outcome, and mediator or moderator roles to variables of interest. Earlier studies have only examined a subset of the relevant variables, limiting the understanding of their interrelations, particularly for individuals engaged in risky professions (Fisher et al., 2022; Huang, 2022; Strohmaier et al., 2020).

The application of network analysis to study psychopathology represents a relatively recent but powerful methodology for examining complex systems characterized by asymmetrical relationships. In line with this approach, Borsboom (2017) introduced the Network Theory of Psychopathology. According to this theory, psychopathology is conceptualized as a complex network of interconnected symptoms rather than a single underlying cause or factor. The network model emphasizes the importance of symptom interactions and their influence on each other. Rather than assuming a hierarchical structure with one central cause, the theory suggests that symptoms can directly influence and activate

each other. This novel perspective highlights the interconnections and interplay among symptoms, challenging the traditional approach of isolating them in treatment.

Network relationships can be divided into two types: directional and nondirectional, both of which are used to study complex systems' structure and dynamics. Nondirectional network analysis assumes that node relationships are symmetrical and have no direction. Unlike traditional methods that require the designation of dependent or independent variables, nondirectional network analysis allows for the examination of multiple relations among these factors within a single network and reduces the likelihood of encountering false positives resulting from repetitive testing (Åkerblom et al., 2021).

While directional network analysis offers a more detailed comprehension of complex systems' structure and dynamics, particularly when directionality is relevant. However, it is important to note that in this study, such model is not employed to infer causality but rather to explore and visualize potential associations within a theoretically informed framework. The directionality in these models is guided by established theoretical frameworks and prior research, which helps organize the analysis to reflect current knowledge. While these models indicate potential pathways and associations, they do not aim to establish causal relationships. More informative measures are necessary to fully understand the interrelation between variables such as mindfulness and emotion regulation in firefighters.

Borsboom et al. (2021) discussed the robustness of network measures, emphasizing their applicability in psychological science. Numerous empirical studies have successfully employed directed network analysis to implement its potential for insight into structural relations among core psychological processes to inform the health psychology science and practice (Christensen et al., 2020; Hevey, 2018; Heeren et al. 2021; Ventura-León et al., 2023). For example, it has already been applied to investigate interactive relations between

mindfulness facets, distress variables (Barcaccia et al., 2020; Medvedev et al., 2021), and Big Five personality traits (Roemer et al., 2023).

In this study, the Bayesian Gaussian Graphical Models (BGGM) was employed to conduct the directional network analysis to analyse the relationships between mindfulness, emotion regulation, and alcohol use in firefighters and military veterans. This method allows for the incorporation of prior knowledge into the analysis, enhancing the stability and accuracy of parameter estimates. BGGM was chosen for its robustness, particularly under limited sample sizes or when prior information is valuable.

Previous studies mentioned above have focused on uncovering and addressing the mental health concerns of high-risk populations, particularly those with military backgrounds. Our current study builds on the work of Bartlett et al. (2018), which included a total of 910 career firefighters, and they compared the mental health outcomes of firefighters with military veteran status to those without. They anticipated that military veteran firefighters would experience more severe mental health challenges. Their analysis, using one-way analyses of covariance (ANCOVA), which controlled for factors like age, gender, and race/ethnicity, showed that military veteran firefighters indeed had a significantly higher risk for issues such as sleep disturbances, depression, and post-traumatic stress symptoms. This finding highlighted the need for a deeper understanding of the specific risk and resilience factors affecting this group and highlighted the importance of targeted mental health support.

Expanding on Bartlett et al. (2018), the objective of this follow-up research was to address gaps identified in the previous research and examine how different aspects of mindfulness relate to the ability to regulate emotions among firefighters and military veterans using both nondirectional and directional network analysis because it can provide a superior understanding of the complex system under investigation. The hypotheses outlined focus on associations rather than causal relationships, with the directional models designed to test

these associations in a structured manner. Specifically, it was hypothesized that certain facets of mindfulness—such as acting with awareness, observing, non-reacting, and non-judging—would be negatively associated with difficulties in regulating emotions, particularly in terms of emotion nonacceptance. Additionally, the non-judging and describing facets were expected to be negatively associated with difficulties in emotional clarity, while acting with awareness was hypothesized to be positively related to goal-oriented behaviours. The study also considered the influence of alcohol consumption as a controlling factor, hypothesizing a positive relationship with impulsivity and a negative relationship with emotional clarity. Furthermore, the analysis controlled for firefighters' age, given its potential relation to emotion regulation, and ensured the sample included experienced firefighters.

Method

Participants

This study is a follow-up analysis of data gathered from a larger project that examined the impact of stress and health-related behaviours among firefighters (Bartlett et al., 2018). The full sample included 910 firefighters, 209 of whom were military veterans, as reported in the earlier study focused on unrelated research questions and methodology (Bartlett et al., 2018). The current study included 685 firefighters, of which 154 (22.5%) were military veterans, who completed measures on mindfulness, difficulties in regulating emotion, and alcohol use. Table 1 demonstrated the demographic characteristics of the full sample and the sample extracted for the current study, including statistical comparisons of these samples to ensure that the current sample is representative of the full study sample. It is shown that there were no statistical differences between these samples. In the current sample, 8.8% displayed clinical PTSD scores according to criteria proposed by Ibrahim et al. (2018). The research was carried out at a fire department located in a large metropolitan area in the southern part of the United States.

Table 1*Descriptive statistics for participant demographics.*

	Full sample (<i>n</i> = 910)	Current Sample (<i>n</i> = 685)	<i>p</i> -value
Age <i>M</i> (<i>SD</i>)	38.40 (8.64)	38.65 (8.57)	0.449
Gender <i>n</i> (%)			
Male	862 (94.7%)	641 (93.6%)	0.129
Female	43 (4.7%)	39 (5.7%)	0.358
Transgender	5 (0.5%)	5 (0.7%)	0.750
Race/Ethnicity <i>n</i> (%)			
White	675 (74.2%)	532 (77.7%)	0.085
Hispanic/Latino	250 (27.5%)	178 (26.0%)	0.420
Black/African American	117 (12.9%)	76 (11.1%)	0.370
‘Other’	84 (9.2%)	53 (7.7%)	0.256
Asian	17 (1.9%)	11 (1.6%)	0.658
Native Hawaiian/Pacific Islander	1 (0.1%)	1 (0.1%)	--
American Indian/Alaskan Native	16 (1.8%)	12 (1.8%)	0.802
Education <i>n</i> (%)			
8th Grade	4 (0.4%)	3 (0.4%)	0.930
GED (or equivalent)	7 (0.8%)	2 (0.3%)	0.127
High School	75 (8.2%)	56 (8.2%)	0.962
Some College	427 (46.9%)	323 (47.2%)	0.834
Bachelor's Degree	397 (43.6%)	301 (43.9%)	0.867
Marital status <i>n</i> (%)			
Married	623 (68.5%)	464 (67.7%)	0.896
Divorced	55 (6.0%)	53 (7.7%)	0.208
Living with Partner	45 (4.9%)	37 (5.4%)	0.568
Single	185 (20.3%)	129 (18.8%)	0.465
Widowed	2 (0.2%)	2 (0.3%)	0.890
Employment status <i>n</i> (%)			
Part-time Paid	14 (1.5%)	6 (0.9%)	0.111
Part-time Volunteer	3 (0.3%)	2 (1.2%)	0.155
Full-time Paid	888 (97.7%)	674 (99.6%)	0.118
Full-time Volunteer	4 (0.4%)	3 (0.4%)	0.823
Years of service <i>M</i> (<i>SD</i>)	13.17 (9.12)	13.30 (8.78)	0.583

Procedure

Data collection occurred from 2016 to 2018 at a large urban fire department in the southern part of the United States. Interested participants completed a consent form and were informed about the possible pros and cons of their involvement. To qualify, individuals needed to be currently employed firefighters, at least 18 years old, and have provided the

consent form. Those who met the criteria and had submitted the necessary form proceeded to complete a survey comprising a concise demographic questionnaire and multiple evaluations of mental well-being. Upon finishing the study, participants could elect to be entered into a raffle to win various rewards (e.g., gift cards). Prior to collecting any data, the research was authorized by the relevant University Ethics Committees.

Measures

Demographic questionnaire. Participants were requested to provide information about their demographics, including their social and economic background, as well as their personal history serving as firefighters or in the military.

Five Facet Mindfulness Questionnaire (FFMQ). The FFMQ (Baer et al., 2006) is a well-known self-reported assessment tool consisting of 39 items that evaluate five aspects of mindfulness. A 5-point Likert scale was used, ranging from "*Never or very rarely true*" to "*Very often or always true*". The five facets of mindfulness assessed including acting with awareness (act aware), describing (describe), observing (observe), non-reacting to inner experience (nonreact), and non-judging of experience (nonjudge). It is important to note that 19 of the items are worded negatively and need to be reverse coded before analysing the data. Researchers in New Zealand used the Rasch methodology to validate this measure, and they developed conversion tables to transform ordinal scores into interval-level data, which were applied in the present study (Medvedev et al., 2017). The reliability of each mindfulness facet tested with the current data were as follows: observing ($\omega=0.87$); describing ($\omega=0.77$); acting with awareness ($\omega=0.92$); non-judging ($\omega=0.90$); and non-reacting ($\omega=0.88$).

Difficulties in Emotion Regulation Scale - 16 item version (DERS-16). The DERS-16 (Gratz & Roemer, 2004) is a tool used to assess emotional regulation, with five subscales: nonacceptance (difficulties in accepting emotions), goals (difficulties in maintaining goal-directed behaviour when distressed), impulse (difficulties in impulse control), strategies

(limited access to emotion regulation strategies), and clarity (a lack of emotional clarity). The same 5-point Likert scale as the DERS-36 (ranging from almost never to almost always) is used to score the items, with a total score range of 16-80. The DERS-16 has been validated in three samples, showing good construct validity, both in terms of convergent and discriminant validity (Bjureberg et al., 2016). Additionally, the tool has demonstrated great internal consistency with the current dataset ($\omega=0.94$).

Alcohol Use Disorders Identification Test (AUDIT). The AUDIT (Saunders et al., 1993) is a 10-item screening tool that assesses problematic drinking behaviours using a 5-point Likert scale. Developed by the World Health Organization, it includes subfactors for hazardous drinking, alcohol dependence, and harmful drinking, with a cut-off score of 8 indicating potential AUD. The AUDIT has high sensitivity and specificity for identifying hazardous or harmful drinking, as well as probable alcohol dependence (sensitivity: 87 – 96%, specificity: 81 – 98%; Saunders et al., 1993) Test-retest reliability is good ($r=0.84$; Selin, 2003), and internal consistency was high with the current dataset ($\alpha=0.85$; $\omega=0.86$). The AUDIT has been extensively validated, demonstrating good convergent and discriminant validity. The scoring ranges from 0 to 40, with higher scores indicating more severe problematic drinking behaviours. The AUDIT is a reliable and valid tool for identifying individuals presenting with alcohol problems, with potential applications in various clinical and research settings (Brummer et al., 2022; Chambers et al., 2020; Thomsen et al., 2018).

Data Analyses

Our study employed Bayesian Gaussian Graphical Models (BGGM) (Williams & Mulder, 2020) using RStudio software (RStudio Team, 2020). BGGM facilitates directional network analysis through the integration of prior knowledge or assumptions about relationships, enabled by the statistical R package (López-Pernas et al., 2024; Rowland et al., 2023). In our study, the analysis was structured based on Directed Acyclic Graphs (DAGs),

which are graphical structures where nodes (variables) such as mindfulness facets (e.g., acting with awareness, observing) and specific difficulties in emotion regulation (e.g., nonacceptance of emotions) are connected by directed edges, indicating relationships or dependencies (Digitale et al., 2022; Tokhmetov et al., 2023). The directionality within these models was guided by existing theoretical frameworks and prior empirical evidence. It is crucial to note that the assignment of predictors and outcomes in the DAGs is based on theoretical reasoning and established research, rather than being arbitrary or purely data-driven. Given the limitations of the nature of cross-sectional data utilized, the study does not make causal claims, and the directional models should be understood as tools for exploring associations within a theoretically grounded framework.

The use of DAGs in this study is not intended to establish or infer causality in a data-driven way. Instead, DAGs are employed to explicitly map out and structure to explore the relationships between specific facets of mindfulness and emotion regulation difficulties, providing a visual representation of hypothesized associations based on existing theories and previous research. For example, the hypothesized relationship of acting with awareness would negatively influence difficulties in regulating emotions, specifically in reducing emotion nonacceptance, will be visually mapped out allowing us to estimate the potential pathways and their impact on our outcome variables. DAGs help to organize and improve parameter estimation and inference accuracy, particularly when sample sizes are limited or when relevant information is available from previous research (Williams & Mulder, 2020). These models help to organize the analysis and highlight potential pathways that align with existing theories and previous research, rather than asserting or testing any causal relationships.

This method requires us to make some initial guesses, known as 'priors,' about the relations between different variables in our data. We chose BGGM for its ability to

incorporate prior knowledge into the analysis, enhancing the stability and accuracy of parameter estimates, particularly under limited sample sizes or when prior information is valuable (Huth et al., 2023). Utilizing the BGGM package, we estimated posterior means, standard deviations, and credible intervals, focusing on the connections between mindfulness, emotion regulation, and alcohol use in firefighters and military veterans. Moreover, BGGM offers posterior distributions for all parameters, giving a more thorough understanding of the uncertainty in parameter estimates.

The posterior mean, posterior standard deviation (SD), and credible intervals are key statistical measures commonly used in Bayesian analysis to summarize the posterior distribution of parameters (Jackson et al., 2014; Xia et al., 2024). In BGGM, relationships between nodes represent the posterior means of the associations (Rubin et al., 2021). The posterior mean represents the estimated average value of a variable or parameter after considering both prior beliefs and observed data. For instance, in our study, the posterior mean provided an estimate of the strength of the association between non-judging and emotional clarity difficulty. This estimate was derived from the posterior distribution, which represents the updated probability distribution that reflects our refined beliefs about a parameter or variable after incorporating both prior knowledge and new data. The posterior standard deviation indicates the spread or variability of the posterior distribution around the posterior mean. A smaller standard deviation suggests that the values are closely clustered around the mean, while a larger standard deviation suggests more variability. Credible intervals represent ranges of values within which the true value of the parameter is likely to fall with a certain degree of confidence, typically expressed as a percentage.

We used the BGGM package in R for the partial correlation network analysis, visualized through the qgraph package, to represent unique associations between variables. The unique associations were represented as edges or lines, the blue edges represented

positive correlations, while red edges represented negative correlations (Liu et al., 2024). The thickness and colour intensity of the edges represented the strength of the association between the nodes. To ensure robustness, we conducted bootstrapping with 5000 iterations, where we repeated our analysis multiple times to check for consistency, providing confidence intervals for network edges and thus quantifying uncertainty.

Specifically, the “explore” function of BGGM package was used to estimate partial correlations between nodes while accounting for all other relations in the network (Chalmers et al., 2022). For example, we analysed the partial correlation between alcohol use and impulsivity, controlling for other variables like emotional clarity and mindfulness facets. The estimated associations were based on a semi-parametric copula model that used ranked likelihood. The resulting partial correlation matrix retained only the relationships whose 95% credible intervals did not include zero. A 95% credible interval provides a range of values where a population parameter is expected to fall with 95% certainty. The retained partial correlations in the matrix were statistically significant and could be used to infer the relationships between the variables in the model.

This BGGM approach requires the specification of priors, it inherently incorporates a regularization technique through its Bayesian framework, specifically using prior distributions on the partial correlation coefficients. Regularization is a technique in BGGM used to prevent overfitting and improve the generalizability of statistical models. Unlike traditional regularization algorithms such as LASSO or Ridge, BGGM utilizes a Bayesian approach, where regularization is achieved by setting priors on the parameters (partial correlations) (Truong et al., 2023). We specified normal priors for the partial correlation coefficients with a standard deviation of 0.25. This choice reflects our assumption that many relationships in our model are likely to be weak or non-existent, typical in psychological data where strong correlations are rare.

By setting the prior SD to 0.25, we essentially apply a form of regularization, shrinking the estimated partial correlations towards zero. This helps produce a more stable and interpretable model, especially when dealing with complex data and potential multicollinearity issues (Truong et al., 2023). Multicollinearity issues occur when variables in our data are too closely related, which can make it hard to interpret our results. This Bayesian approach to regularization is advantageous in handling multicollinearity, as it shrinks the estimates of weak partial correlations towards zero, reducing its potential impact (Korobilis & Shimizu, 2022). We ensured that all details of our Bayesian model specification, including the prior settings, were transparently reported, facilitating full reproducibility of our analysis and enabling other researchers to understand the influence of our methodological choices on the results. Using this approach for partial correlation network analysis, we controlled for linear relations between variables while addressing multicollinearity issues, providing a robust approach to estimate unique associations in complex psychological data.

In the context of our BGGM analysis, predictability emerges as a more pertinent and informative measure compared to traditional centrality metrics. This is primarily because BGGM focuses on understanding the unique, direct relations between variables, reflected in partial correlations that consider the influence of all other variables in the network. Predictability in BGGM provides insights into how much of a node's variability is explained by its direct connections within the network without estimating a potential direction of such links (Haslbeck & Waldorp, 2017). This is important for our study as it directly aligns with our goal to examine the direct and unique influences among variables such as facets of mindfulness, emotion regulation, and alcohol use. For example, we assessed the predictability of emotion regulation difficulties based on their direct relationships with mindfulness facets. It allows us to understand the extent to which one variable can be predicted based on its

relationships with others, offering practical insights for interventions and policymaking to improve emotional outcomes in firefighters and veterans (Chalmers et al., 2022).

Centrality measures, on the other hand, often emphasize the importance of a node based on its overall connectivity within the network (Csató, 2016). While this can be useful in many contexts, in BGGM, where the focus is on the strength and significance of direct relationships, centrality may provide less relevant information. In our case, understanding the predictability of each node offers more specific insights for our research objectives than assessing their centrality. Thus, while centrality can complement our understanding of the network, predictability is a more aligned and sufficient indicator of node importance in the context of our analysis.

Comparison of Network Modelling Methodologies

While directional network analysis stands on its own merit, it is also essential to consider its strengths relative to other network modelling methodologies. Directional network analysis, Structural Equation Modelling (SEM), and Group Iterative Multiple Model Estimation (GIMME) are all approaches used to analyse variable relationships in data, but they have distinct principles, assumptions, and applications. In terms of the analysis of relationships, directed network analysis focuses on capturing directional relationships within a network, while SEM examines relationships between observed and latent variables (Sarstedt & Ringle, 2020), and GIMME is specialized for estimating directed functional connectivity over time (Yin et al., 2023). Furthermore, directed network analysis is the optimal choice for the current study due to its versatile and applicable to assumes asymmetrical relationships in various fields, SEM is commonly used in the social sciences for hypothesis testing and assumes latent variable structures, and GIMME is specialized for dynamic changes in relationships over time in neuroimaging data. Overall, directed network

analysis emerges as the best choice for studying mindfulness and emotion regulation aspects in firefighters.

In our study, we aimed to go beyond identifying relationships between variables to understanding how these factors might influence each other. To achieve this, we employed a directional network analysis using the "deal" package in R, which is specifically designed for learning the structure of Bayesian networks, represented by DAGs, from data. The "deal" package facilitates the identification of directional relationships by estimating a Bayesian network structure that reflects potential causal pathways between variables. This process involves iterating through possible network structures to find the one that best fits the data. In our study, we conducted 10,000 iterations to robustly estimate the network structure, similar to approaches used in studies such as Liu et al. (2024). The high number of iterations was crucial to ensure the reliability of the network structure, accounting for the inherent variability and complexity of our dataset.

Key concepts in this modelling process include the identification of "parent" and "child" facets within the network. In a Bayesian network, a "parent" node is a variable that directly influences another variable, known as the "child" node (George & Renjith, 2021). For example, in our model, a specific facet of mindfulness (the parent) might influence a particular aspect of emotion regulation (the child). By learning these directional relationships, we can hypothesize how changes in one variable might lead to changes in another, offering insights into potential causal pathways. After determining the network structure, we visualized the directed graph using the "Rgraphviz" package. This visualization provided a clear representation of the directional relationships, allowing us to interpret the potential influence of each variable within the network. Additionally, we assessed the strength of these connections to understand not only the presence of directional relationships but also their relative impact within the network. This comprehensive approach enhances the robustness of

our analysis and provides deeper insights into the complex interplay between mindfulness facets, emotion regulation difficulties, and alcohol use.

Results

Table 2 provides an overview of the descriptive statistics for the key variables involved in the study, including the mindfulness facets and emotion regulation difficulties, alcohol use, and age. The table lists the mean, standard deviation, minimum, and maximum values for each variable. Among the mindfulness facets, non-judging (Nonjudge) exhibited the highest mean score ($M = 32.08$, $SD = 6.67$), indicating that firefighters and military veterans generally reported a strong tendency to refrain from judging their inner experiences. In contrast, acting with awareness (Actaware) also showed a relatively high mean ($M = 31.32$, $SD = 6.78$), suggesting a significant level of mindfulness in actions. Followed by describing (Describe) facet of mindfulness, with a higher mean of 27.35 ($SD = 6.299$) reflecting those firefighters generally found it easier to describe their experiences. However, mindfulness facet observing of inner experience (Observe) and Non-reactivity to Inner Experience (Nonreact) had relatively lower mean score than other facets ($M = 20.15$, $SD = 7.27$ and $M = 20.55$, $SD = 7.08$, respectively), suggesting that firefighters may find it more challenging to consistently observe and react non-reactively to their inner experiences.

On the other hand, in terms of the DERS variables, lack of emotion regulation strategies (Strategies) has the highest mean score ($M = 6.29$, $SD = 2.62$), indicating that firefighters report a relatively higher level of difficulty in accessing emotional regulation strategies. While inability of emotional clarity (Clarity) has the lowest mean score ($M = 2.55$, $SD = 1.13$), suggesting that firefighters experience significant challenges in understanding and clearly identifying their emotional experiences. Non-acceptance of emotions (Nonaccept) shows a moderate mean score ($M = 4.13$, $SD = 1.98$), reflecting a moderate struggle with accepting emotional experiences. Meanwhile, goal-directed behaviour (Goals) ($M = 4.71$, SD

= 2.17) and impulsivity (Impulse) ($M = 3.71$, $SD = 1.53$) indicate notable challenges related to managing goal-oriented actions and controlling impulsive behaviours, respectively.

Table 2

Descriptive statistics of FFMQ, DERS, alcohol use, and age.

	N	Minimum	Maximum	Mean	Std. Deviation
Observe	685	8	40	20.15	7.274
Describe	685	10	40	27.35	6.299
Actaware	685	8	40	31.32	6.780
Nonjudge	685	8	40	32.08	6.673
Nonreact	685	7	35	20.55	7.081
Clarity	685	2	9	2.55	1.130
Goals	685	3	15	4.71	2.167
Impulse	685	3	14	3.71	1.528
Strategies	685	5	25	6.29	2.617
Nonaccept	685	3	15	4.13	1.978
Alcohol	685	0	32	5.53	5.014
Age	685	20	62	38.65	8.574

Following the descriptive analysis, Table 3 presents the results of a partial correlation analysis conducted to explore the relationships between the key variables, controlling for age. Notable correlations include a strong positive relationship between nonreact and observe ($r = .702$, $p < .001$), suggesting that those who are less reactive to their inner experiences are also more observant. Additionally, a significant negative correlation was observed between nonjudge and observe ($r = -.550$, $p < .001$), indicating that firefighters who are less judgmental of their inner experiences tend to be less observant. Furthermore, a strong negative correlation was found between actaware and observe ($r = -.444$, $p < .001$), indicating

that those who are highly focused on the task at hand leaves less cognitive capacity to be aware of or monitor internal experiences. In regards to the DERS variables, strategies showed strong positive correlations with goals ($r = .726, p < .001$), and with impulse ($r = .679, p < .001$), highlighting that access to emotion regulation strategies is crucial for managing these interconnected difficulties. Nonaccept also correlated positively with strategies ($r = .717, p < .001$), indicating that those who struggle to accept their emotions often face challenges in accessing emotion regulation strategies.

Alcohol use was found to have a negative connection with mindfulness facets describe ($r = -.210, p < .001$) and actaware ($r = -.230, p < .001$), indicating that higher alcohol consumption is linked to decreased mindfulness in both areas. In contrast, there is a moderate positive association between alcohol usage and difficulties accessing emotion management strategies ($r = .284, p < .001$), suggesting that firefighters who struggle with emotion regulation may engage in increased alcohol consumption. Alcohol use is strongly connected with difficulties in goal-directed behaviour ($r = .257, p < .001$), suggesting that firefighters who struggle to focus on their goals may be more likely to consume alcohol.

Mindfulness correlates with emotion regulation difficulties, including a negative correlation ($r = -.455, p < .001$) between actaware and goals. This suggests that firefighters who are more mindful and attentive to their actions have fewer difficulties maintaining goal-directed behaviour. There is a moderate negative association ($r = -.426, p < .001$) between nonjudgement and nonacceptance, indicating that firefighters who are less judgemental of their inner experiences have fewer issues accepting their feelings. A moderate negative association ($r = -.422, p < .001$) between nonreact and methods suggests that firefighters who are less reactive to their emotions are more equipped to use emotion control strategies. These connections emphasise the interconnectedness of mindfulness and emotion regulation, with

particular aspects of mindfulness potentially acting as protective factors against certain issues in emotion regulation.

Table 3*Partial correlation matrix controlling for age.*

Control Variables		Observe	Describe	Actaware	Nonjudge	Nonreact	Clarity	Goals	Impulse	Strategies	Nonaccept	Alcohol
Age Observe	Correlation	1.000	.357	-.444	-.550	.702	.093	.161	.052	.136	.182	.030
	Significance (2-tailed)	.	<.001	<.001	<.001	<.001	.015	<.001	.178	<.001	<.001	.439
	df	0	682	682	682	682	682	682	682	682	682	682
Describe	Correlation	.357	1.000	.155	.111	.523	-.297	-.186	-.211	-.236	-.151	-.210
	Significance (2-tailed)	<.001	.	<.001	.004	<.001	<.001	<.001	<.001	<.001	<.001	<.001
	df	682	0	682	682	682	682	682	682	682	682	682
Actaware	Correlation	-.444	.155	1.000	.656	-.318	-.385	-.455	-.352	-.422	-.372	-.230
	Significance (2-tailed)	<.001	<.001	.	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
	df	682	682	0	682	682	682	682	682	682	682	682
Nonjudge	Correlation	-.550	.111	.656	1.000	-.374	-.350	-.312	-.243	-.371	-.426	-.146
	Significance (2-tailed)	<.001	.004	<.001	.	<.001	<.001	<.001	<.001	<.001	<.001	<.001
	df	682	682	682	0	682	682	682	682	682	682	682
Nonreact	Correlation	.702	.523	-.318	-.374	1.000	-.014	.056	-.079	-.019	.050	-.025
	Significance (2-tailed)	<.001	<.001	<.001	<.001	.	.707	.141	.039	.628	.195	.518
	df	682	682	682	682	0	682	682	682	682	682	682
Clarity	Correlation	.093	-.297	-.385	-.350	-.014	1.000	.562	.485	.621	.499	.207
	Significance (2-tailed)	.015	<.001	<.001	<.001	.707	.	<.001	<.001	<.001	<.001	<.001
	df	682	682	682	682	682	0	682	682	682	682	682
Goals	Correlation	.161	-.186	-.455	-.312	.056	.562	1.000	.622	.726	.630	.257
	Significance (2-tailed)	<.001	<.001	<.001	<.001	.141	<.001	.	<.001	<.001	<.001	<.001
	df	682	682	682	682	682	682	0	682	682	682	682
Impulse	Correlation	.052	-.211	-.352	-.243	-.079	.485	.622	1.000	.679	.500	.332
	Significance (2-tailed)	.178	<.001	<.001	<.001	.039	<.001	<.001	.	<.001	<.001	<.001
	df	682	682	682	682	682	682	682	0	682	682	682
Strategies	Correlation	.136	-.236	-.422	-.371	-.019	.621	.726	.679	1.000	.717	.284
	Significance (2-tailed)	<.001	<.001	<.001	<.001	.628	<.001	<.001	<.001	.	<.001	<.001
	df	682	682	682	682	682	682	682	682	0	682	682
Nonaccept	Correlation	.182	-.151	-.372	-.426	.050	.499	.630	.500	.717	1.000	.159
	Significance (2-tailed)	<.001	<.001	<.001	<.001	.195	<.001	<.001	<.001	<.001	.	<.001
	df	682	682	682	682	682	682	682	682	682	0	682
Alcohol	Correlation	.030	-.210	-.230	-.146	-.025	.207	.257	.332	.284	.159	1.000
	Significance (2-tailed)	.439	<.001	<.001	<.001	.518	<.001	<.001	<.001	<.001	<.001	.
	df	682	682	682	682	682	682	682	682	682	682	0

There was no collinearity between variables included in the network as evidenced by Variance Inflation Factor (VIF) ranging from 1.18 to 3.57. VIF was calculated with IBM SPSS Statistics (Version 27). This involved a systematic process beginning with running separate linear regression analyses for each independent variable in the model, with the remaining variables serving as predictors. From the regression output, R-squared values were obtained for each model, and subsequently, VIF values were manually calculated using the formula $VIF = \frac{1}{(1-R^2)}$ for each independent variable. This procedure was repeated iteratively for all independent variables in the model. The interpretation of VIF values followed established guidelines, where values below 5 typically indicate minimal multicollinearity, while values exceeding 10 suggest significant multicollinearity requiring attention. Documentation of these findings was meticulous, ensuring transparency and thoroughness in the assessment of multicollinearity within the regression model. Overall, the VIF values ranging from 1.18 to 3.57 indicated that multicollinearity was not a major concern among the variables in the model, thereby supporting the validity of the regression analysis results.

However, the concept of multicollinearity is important in traditional statistical analyses like regression, network analyses such as BGGM and DAG naturally incorporate mechanisms to handle the interdependencies among variables, which in other contexts would be labelled as multicollinearity. This inherent capability of network analyses to adjust for shared variances among variables offers a more nuanced and accurate understanding of the relationships and dependencies within the data.

Fig. 1 illustrates the nondirectional network analysis of among mindfulness facets, difficulties in regulating emotion, alcohol, and age. In nondirectional network analysis all variables including demographic covariates such as age can be included as nodes in the network, which permits to evaluate their potential relations with primary variables of interest. According to Fig. 1, the facet of mindfulness nonjudge was associated with greater emotional

acceptance and clarity, yet was also linked to the emotion regulation problem of struggling to maintain goal-directed behaviour. Besides, the facet of mindfulness actaware was positively linked to the ability to maintain goal-oriented behaviour and negatively associated with impulsivity. Alcohol was positively linked to impulsivity and had a negative association with the describing facet of mindfulness. Overall, difficulties in regulating emotion were positively linked together, and most mindfulness facets showed positive relationships. The directed network analysis revealed nonjudge and emotion regulation strategy as the parental predictors in the entire network. Nonjudge exhibited a protective role, supporting most mindfulness facets and contributed to better emotion regulation, while emotion regulation strategy exacerbated challenges in emotion regulation, serving as a risk factor.

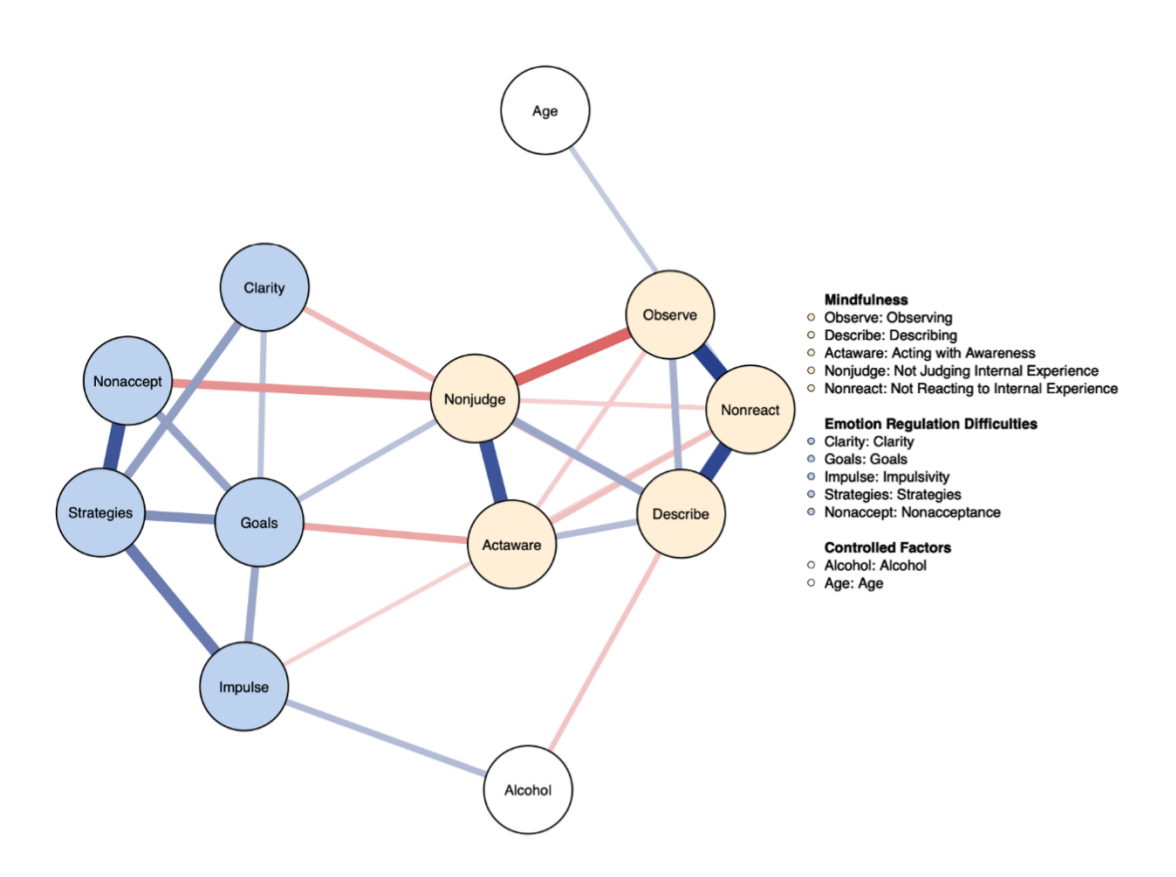


Fig. 1 Network analysis of five mindfulness facets, five aspects of difficulties in regulating emotion, alcohol, and other factors.

Table 4 presents the estimated posterior means, standard deviations, and credible intervals obtained through analysis using the BGGM package. These results elucidate the connections between five mindfulness facets, five dimensions of emotion regulation difficulties, and alcohol use within the firefighter and military veteran populations. Specifically, our examination of the mindfulness facet observe reveals important insights. The posterior mean value of 0.61 suggests that, on average, this aspect of mindfulness tends to have a value around 0.61 in our sample of firefighters and military veterans. The posterior SD of 0.03 indicates relatively low variability around this mean estimate. Furthermore, the credible interval ranging from 0.55 to 0.66 suggests that we can be 95% confident that the true value of observe falls within this interval based on the Bayesian analysis.

Table 4*Estimated posterior means, standard deviations, credible lower and upper bound.*

Node	Post. means	Post. SD	Cred. lb	Cred. ub
Observe	0.61	0.03	0.55	0.66
Describe	0.46	0.03	0.41	0.51
Actaware	0.54	0.03	0.49	0.60
Nonjudge	0.59	0.03	0.54	0.65
Nonreact	0.61	0.03	0.55	0.67
Clarity	0.45	0.03	0.40	0.50
Goals	0.62	0.03	0.57	0.67
Impulse	0.52	0.03	0.47	0.58
Strategies	0.72	0.03	0.67	0.77
Nonaccept	0.57	0.03	0.52	0.63
Alcohol	0.16	0.02	0.12	0.20
Age	0.04	0.01	0.02	0.07

Table 5 includes the resulting posterior correlation matrix and retained only the relationships whose 95% credible intervals did not include zero. In the correlation matrix, significant associations emerge among mindfulness facets, emotion regulation difficulties, and alcohol use within the sample. Notably, a strong negative correlation of -0.34 is found between mindfulness facet observe and nonjudge, this is possibly indicating that individuals who are more observant tend to exhibit lower levels of judgmental attitudes towards their experiences. Additionally, mindfulness facet non-reacting exhibits strong positive correlations with observe (0.48) and describe (0.46) which implies that the capacity to remain non-reactive in the face of emotional stimuli may contribute to heightened observation of one's internal experiences and improved ability to articulate and understand emotions. Conversely, age appears to have weak or null correlations with all other variables, suggesting

that age may not be strongly associated with mindfulness facets, emotion regulation difficulties, or alcohol use in this firefighters' sample.

Table 5*Posterior correlation matrix for nondirectional network.*

Variables	Observe	Describe	Actaware	Nonjudge	Nonreact	Clarity	Goals	Impulse	Strategies	Nonaccept	Alcohol
Describe	0.20										
Actaware	-0.11	0.17									
Nonjudge	-0.34	0.23	0.43								
Nonreact	0.48	0.46	-0.14	-0.11							
Clarity	0.00	-0.16	0.00	0.00	0.00						
Goals	0.00	0.00	-0.20	0.16	0.00	0.15					
Impulse	0.00	0.00	0.00	0.00	-0.10	0.00	0.22				
Strategies	0.00	0.00	0.00	0.00	0.00	0.25	0.28	0.34			
Nonaccept	0.00	0.00	0.00	-0.24	0.00	0.00	0.24	0.00	0.43		
Alcohol	0.00	-0.13	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	
Age	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00

Note. Non-significant correlations where 95% CI include 0.00 are shown as 0.00 values.

Fig. 2 depicts the estimated directional links among mindfulness facets, difficulties in regulating emotion, alcohol, and age. All directional links presented in Fig. 2 were statistically significant and their exact estimates are included in Table 4. Specifically, both nonjudge and lack of emotion regulation strategies were found each exerting a strong and direct influence on emotional nonacceptance and lack of emotional clarity. A non-judgmental attitude could plausibly compensate for challenges in accepting emotions and achieving emotional clarity. Additionally, nonjudge may also directly facilitate the ability to describe individual experiences. As can be seen on Fig. 2, with the support of a non-judgmental attitude, act aware potentially prevents alcohol abuse directly. On the other hand, a non-judgmental attitude potentially could hinder the ability to attentively observe, which in turn led to decreased non-reactivity, subsequently negatively impacting the ability to describe.

In terms of emotion regulating, the lack of strategies emerged as the parental node, exerting a strong and direct influence on all other facets of difficulties in regulating emotion. Specifically, limited access to emotion regulation strategies significantly contributed to the inability to achieve goals, subsequently affecting both impulsivity and act aware, ultimately leading to alcohol use. Similarly, lack of supporting strategies may also facilitate alcohol abuse by directly impacting impulsivity. Moreover, the absence of supporting strategies also directly impacted emotional clarity, resulting in a diminished ability to describe individual experiences. Additionally, the lack of emotional regulation strategies and the inability to achieve goals positively contributed to emotional nonacceptance. The ability to describe experiences appeared to be an outcome of many variables in the network, specifically it was supported by non-reactivity, acting with awareness, and mindful observing and non-judgmental attitude while impaired by lack of emotional clarity. Finally, describe appeared as directly important in preventing alcohol use. Overall, in the network, nonjudge was identified as the parent node exerting directional influence on protective factors, while the lack of

emotional regulation strategies was identified as the parent node associated with risk factors, with alcohol being the ultimate consequence or outcome variable.

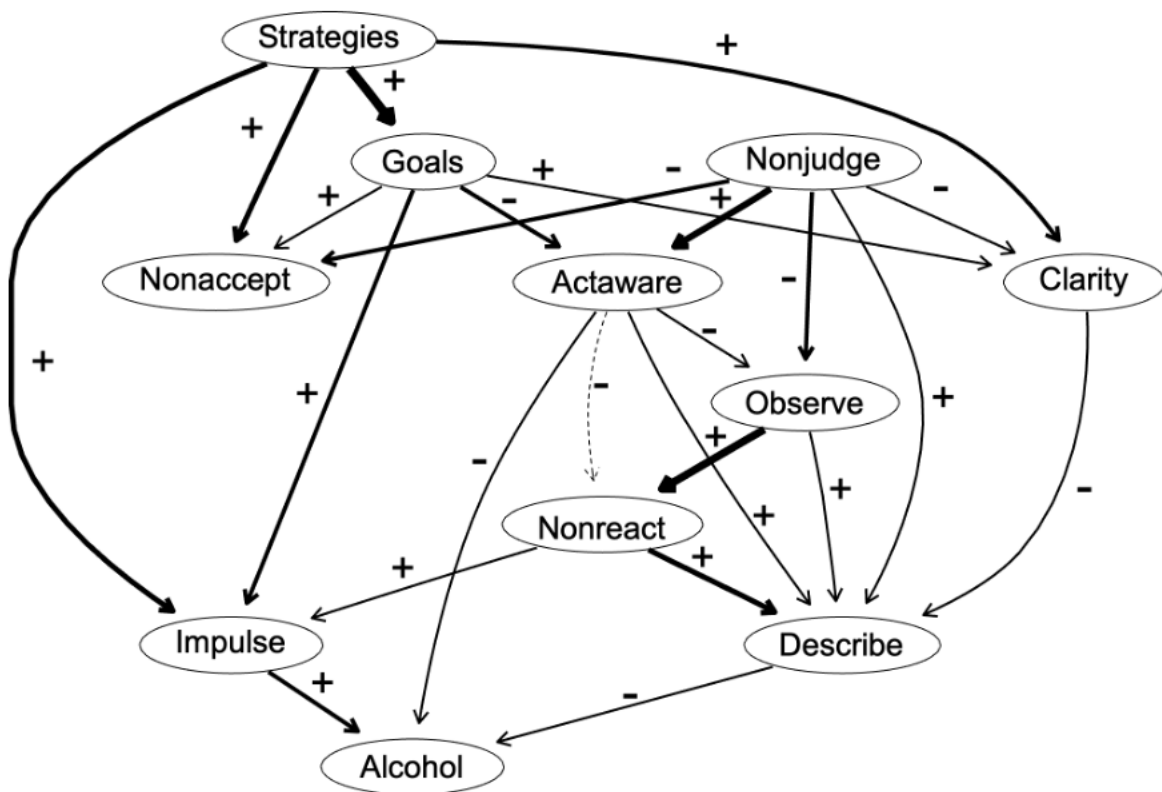


Fig. 2 Directional graph of relationships between five mindfulness facets, five aspects of difficulties in regulating emotion, alcohol, and other factors.

In evaluating the robustness and fit of our DAG analysis, several key aspects stand out. Firstly, the Bayesian network structure was effectively learned using score-based methods, specifically through a Hill-Climbing learning algorithm and Bayesian Information Criterion (BIC) for scoring. The Hill-Climbing algorithm is a search and optimization method commonly used in machine learning and statistics to explore and determine the most suitable network structure based on a given scoring metric, in this case, the BIC. The BIC evaluates the trade-off between model complexity and goodness of fit, penalizing overly complex models to avoid overfitting while ensuring the model adequately captures the underlying relationships among variables. The resultant model, a partially directed graph, comprises 11 nodes and 25 arcs, indicating a moderately complex network structure. This complexity is

further highlighted by the average Markov blanket size of 6.55, suggesting that, on average, each node is directly influenced by over six other nodes. The robustness of the model was further assessed using a bootstrap replicate approach with 10,000 samples. This approach, crucial for evaluating the stability and reliability of the network, yielded significant insights as evidenced in the 'bootnet' results.

The strengths and directions of the connections, as shown in the 'bootnet' head, revealed varying degrees of relationships among the nodes. The strength of the connection indicates the magnitude or intensity of the relationship between two variables, while the direction of the connection indicates the causal direction or influence between the variables. A strength of 1.00 indicates the maximum possible strength, meaning that the variables are highly connected or strongly influence each other. Typically, directional network analyses assign values between 0 and 1 to represent the direction of influence. For instance, a strong connection between observe and nonjudge (strength: 1.00, direction: 0.45) suggests a high degree of dependency or influence, as can be seen on Table 6. Moreover, observe also demonstrates strong positive influences on describe (Strength: 0.82, Direction: 0.73), actaware (Strength: 0.79, Direction: 0.44), and nonreact (Strength: 1.00, Direction: 0.59). These robust connections suggest that heightened observational awareness is strongly linked to improved descriptive abilities, increased awareness of actions, reduced judgmental attitudes, and decreased reactive emotional responses. While weaker positive influences are observed on clarity (Strength: 0.14, Direction: 0.26) and goals (Strength: 0.08, Direction: 0.47), they still signify noteworthy relationships, contributing to the broader understanding of the complex interactions between mindfulness facets and emotion regulation within the sample. A value closer to 1 indicates that the variable on the left-hand side (in this case, observe) has a strong influence on the variables on the right-hand side (for instance, describe). Similarly, a value closer to 0 indicates that the influence is weaker or less direct.

Table 6*Strength and direction estimates for directional network.*

	from	to	Strength	Direction
1	Observe	Describe	0.82	0.73
2	Observe	Actaware	0.79	0.44
3	Observe	Nonjudge	1.00	0.45
4	Observe	Nonreact	1.00	0.59
5	Observe	Clarity	0.14	0.26
6	Observe	Goals	0.08	0.47

Moreover, the use of the optimal cut-off point according to Scutari & Nagarajan (2013) and the subsequent calculation of the average network (avgnet1) and its BIC score (-18711.35) provided a quantitative measure for the goodness-of-fit of the model. This BIC score, compared against the original (-22358.21), indicates an improved fit in the averaged network. A lower BIC score indicates a better fit of the model to the data. The optimal significance threshold found (0.46) was instrumental in determining the strength and relevance of the edges (connections) in the network, as seen in the arc strength computation. The robustness of the findings is further underscored by the inclusion of penalization coefficient (3.27) and the number of tests (995) used in the learning procedure, ensuring that the model is not overfitted and is generalizable. A higher penalization coefficient implies a stronger penalty for complex models, helping to prevent overfitting and ensuring the generalizability of the model to new data. And a higher number of tests allows for a more exhaustive search for the optimal network structure. Finally, the visualization of the DAG, with strengths and thresholds appropriately marked, not only provided a clear depiction of the network but also an intuitive understanding of the relationships between different facets of the data. Overall, these results demonstrate a robust and well-fitted Bayesian network

analysis, substantiating the relationships within the data with statistical rigor and visual clarity.

Fig. 3 shows the predictability plot for each variable in the network analysis. Overall, limited access to relevant emotional regulation strategies explained more variance in the overall network compared to other variables, which was reflected by R^2 around 0.72. The next important variables were difficulties in maintaining goal-directed behaviour, nonreact, observe, nonjudge, emotion nonacceptance, act aware, difficulties in impulsivity control, describe, and emotional clarity, all of which explained relatively high amount of variance in predicting scores of other variables in the network with R^2 range from 0.40 to 0.60. Alcohol had lower predictability compared to the most variables in the network, and lastly age was explaining merely a negligible amount of variance.

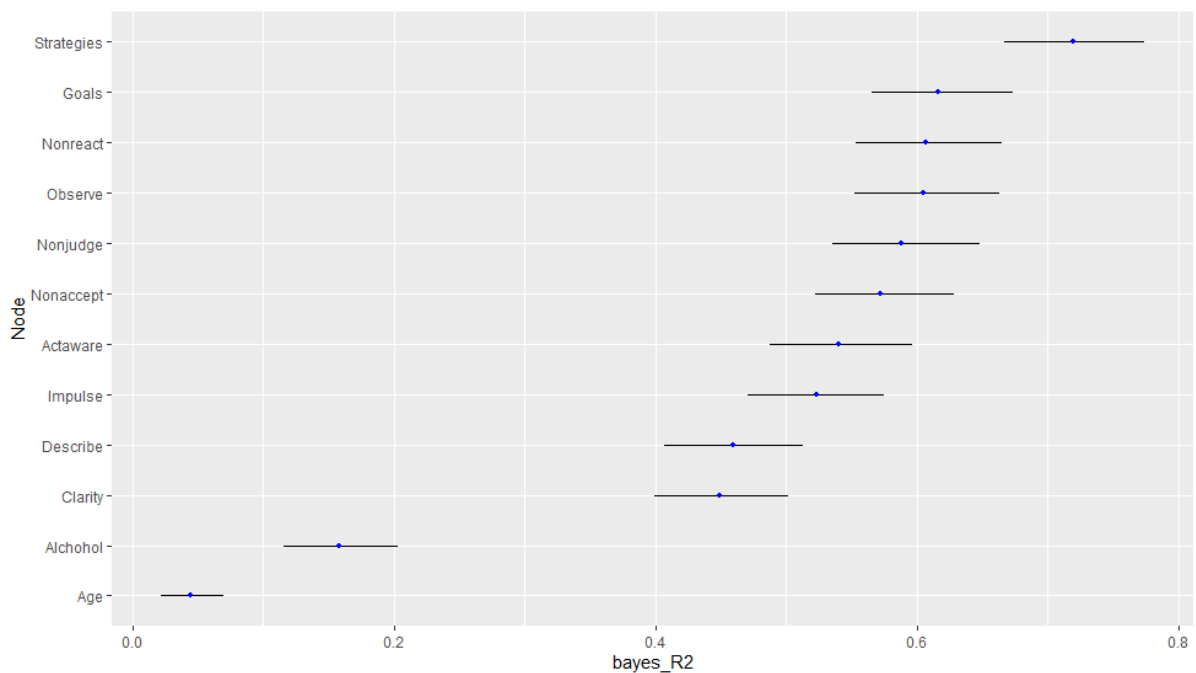


Fig. 3 Predictability plot for each variable in the network analysis.

Discussion

The aim of the current study was to investigate how facets of mindfulness and ability in regulating emotions are interrelated in firefighters and military veterans. A remarkable finding that emerged from the present investigation is the pivotal role of the non-judging

mindfulness facet and limited access to emotion regulation strategies in influencing other variables in the network. The non-judgmental attitude, one of the key facets of mindfulness, was notably associated with acting with awareness and ability to describe, while exhibiting an inverse relationship with the ability to observe and challenges in emotion regulation, such as a nonaccepting attitude and lack of clarity. This association suggests that a non-judgmental attitude may be linked to better emotional clarity and acceptance while also potentially impeding the ability to attentively observe. In regard to emotion regulation, the absence of emotion regulation strategies was positively related to the remaining aspects of DERS. This highlights the potential value of emotion regulation strategies for firefighters, suggesting they may be linked to better outcomes across various aspects of emotion regulation. Notably, this study provides evidence supporting the idea that difficulties in regulating emotion are closely intertwined, illuminating the complex, interconnected nature of emotional regulation. Additionally, the discovery of positive links between most facets of mindfulness further emphasizes the integrated nature of mindfulness as a multifaceted construct, and its beneficial role in emotion regulation. Besides, the results also revealed that alcohol consumption was positively associated with impulsivity and negatively linked to the describe facet of mindfulness. This pattern suggests that firefighters and military veterans who experience higher levels of impulsivity and have greater difficulty describing their internal experiences under high-stress conditions tend to report higher alcohol consumption.

The current study found a strong negative association between non-judging and emotion nonacceptance, partially supporting our hypothesis. However, this finding does not fully align with the results of previous studies (Desrosiers et al., 2013; Garland et al., 2015; Lindsay & Creswell, 2017), which have reported that non-judging, acting with awareness, observing, and non-reacting mindfulness facets were linked to emotion acceptance. These earlier studies posited that the non-judgmental nature of mindfulness involves observing one's

mental states without identification and cultivating acceptance, which is associated with improved self-awareness and curiosity. One of the interpretations for this result could be while mindfulness facets like acting with awareness, observing, and non-reacting involve elements of present-moment attention and non-reactivity, they may not necessarily capture the full spectrum of emotion acceptance. Emotion acceptance extends beyond mere observation and non-reactivity, encompassing an embracing and allowing stance toward the emotional experience.

Furthermore, in interpreting our study's findings, especially the positive association between non-judging and emotion acceptance among firefighters, it is important to consider the distinct characteristics of this group. Firefighters are routinely exposed to high-stress situations and potentially traumatic events, shaping their emotional responses and coping mechanisms. Our study diverges from those involving the general population or groups not regularly facing intense stressors, suggesting that firefighters may respond differently to emotional challenges. It is essential to understand that not judging oneself harshly for having strong negative emotions is a key step toward accepting these emotions. In a profession where encountering intense emotional situations is the norm, the link between mindfulness aspects like non-judging and accepting difficult emotions may be distinct from those less familiar with such experiences. Thus, our results shed light on the complex ways mindfulness interacts with the emotional dynamics in high-risk professions like firefighting. They suggest that the practice of non-judging mindfulness in such contexts may be particularly effective in fostering emotion acceptance, a crucial skill for coping with the demands of this challenging profession.

While research has indicated that mindfulness as a whole has been linked to improved emotion regulation (Roemer et al., 2015; Vago & Silbersweig, 2012), however the specific aspects or components of mindfulness that associated with enhanced emotional clarity are not

yet fully understood. Specifically, the current findings provided partial support for the expected relationship between nonjudgment and inability of emotional clarity, showing a negative correlation. The current findings align with the results of a study conducted by Guendelman and colleagues in 2017, which found that non-judgmental aspect of mindfulness was associated with a decrease in the lack of emotional clarity. This non-judgmental mindset involves individuals adopting an attitude of openness, curiosity, and acceptance towards individuals' emotional experiences. This creates an environment that fosters emotional clarity, where emotions are seen as transient and unique combinations of physiological sensations and cognitive processes (Guendelman et al., 2017).

In fact, when examining the expected direct correlation between the facet of describing and emotional clarity, the findings have been less conclusive and has not emerged in available research (Iani et al., 2018). Interestingly, the directional graph, in the present study estimated a negative association between the ability to describe one's experiences and emotional clarity. A lack of emotional clarity in firefighters might be associated with difficulties in recognizing and labelling their emotions. This association could relate to challenges in describing their emotional experiences to themselves or others (Torre & Lieberman, 2018). More research is needed to explore the intricate dynamics between different facets of mindfulness and their specific impact on emotional clarity, providing a comprehensive understanding of how mindfulness practices associate with emotion regulation.

While Schuman-Olivier et al. (2020) suggested a positive association between high situational and emotional self-awareness and goal-directed behaviours, our study revealed a reversal of the anticipated relationship among firefighters. Essentially, we discovered that firefighters who experience difficulty engaging in goal-directed cognition and behaviour when distressed tend to exhibit lower levels of acting with awareness. Previous studies have

highlighted that individuals with reduced goal pursuit and attainment tend to demonstrate higher level of stress, depression and anxiety (Boudreaux & Ozer, 2013; Christoe-Frazier & Johnson, 2021). Our findings suggested the capacity to stay present and attentive to one's thoughts, feelings, and surroundings might be associated with challenges in focusing on and pursuing objectives during tasks among firefighters and military veterans. This emphasises the importance of addressing goal-directed challenges in high-stress professions, as it directly influences the firefighters' ability to maintain mindfulness and awareness in demanding situations. Understanding this relationship sheds light on the interconnectedness of goal-directed behaviours and mindfulness among individuals in high-stress professions.

In addition, the results partially supported the initial expectations of the positive correlation between alcohol use and impulsivity. The finding aligns with what Stappenback and Fromme (2014) reported that alcohol use could inversely impact emotion regulation and increase impulsivity. The research conducted by Herman and Duka (2019) supports the idea that alcohol consumption can have an impact on impulsivity and reckless behaviour, particularly among Northern Irish military veterans, as found in the study by McGlinchey et al. (2022). This suggests that impulsivity can both contribute to and result from alcohol use in this population. The current results indeed indicated a relationship where impulsivity was associated with alcohol use. Specifically, the directional graph demonstrated alcohol use was caused by impulsivity. There is evidence indicating that impulsiveness might be regarded as a significant risk factor, that associated with increased likelihood of initiating, continuing, and engaging in excessive alcohol use (Adan et al., 2017; Bartlett et al., 2019; Dick et al., 2010; Jakubczyk et al., 2018; Stamatou & Lau-Barraco, 2020). The findings from the directional graph also indicated that acting with awareness might be related to lower levels of alcohol use, potentially serves a protective role in dealing with alcohol abuse. The obtained results align with the findings of Barré et al. (2022), providing consistency in the literature. The

study by Barré et al. (2022) reported that mindfulness can serve as an effective coping mechanism for addressing alcohol use.

Contrary to what was hypothesized, the study did not reveal a direct association between alcohol use and emotional clarity. However, the directed network analysis discovered these two variables were linked through the describing facet of mindfulness. The results suggest that emotional clarity might be positively related to the ability to accurately describe inner experiences, which could be associated with lower alcohol use. One possible explanation is that emotional clarity can offer firefighters insight into the underlying causes and triggers of their emotions. By accurately describing their inner experiences, firefighters develop greater awareness of the emotional states that could be related to their alcohol use. This heightened self-awareness enables more informed decision-making and intentional choices regarding alcohol consumption. Therefore, further research is necessary to explore the potential relationship or mechanism between alcohol use and emotional clarity, aiming to effectively address alcohol-related issues.

Additionally, the ability to describe inner experiences acts as a form of emotional regulation. Individuals with improved emotional clarity might be better able to identify and communicate their emotional needs, potentially reducing reliance on alcohol. Effective management of emotions, particularly through antecedent-focused strategies, might reduce the reliance on maladaptive response-focused strategies like alcohol use, as outlined in the process model of emotion regulation. By employing effective emotion regulation techniques, firefighters may be less likely to use alcohol as a coping mechanism for challenging emotions (Gross, 2015). Roos et al. (2015) conducted a study exploring the association between mindfulness facets and alcohol use, observed a negative correlation between three aspects of mindfulness - describing, acting with awareness, and non-judging - and alcohol outcomes. The study suggested that the describing facet may play a vital role in reducing problematic

drinking as it was significantly associated with alcohol problems through the mediation of risky drinking motives. The ability to recognize and label internal experiences might be related to a reduction in the impact of implicit alcohol motivations on drinking behaviour.

In the network of variables examined in the study, the ability to describe experiences was found to be influenced by several factors, with non-judging playing a significant role. Non-judging entails the ability to observe and embrace internal experiences without resorting to harsh criticism or judgmental attitudes. Our analysis revealed that all facets of mindfulness, including non-reacting, acting with awareness, mindful observing, and maintaining a non-judgmental attitude, are pivotal in facilitating effective description of experiences. Fostering non-reactivity may be associated with more accurate observation and description of experiences, without overwhelming emotions or immediate reactions. Acting with awareness, characterized by full presence and attentiveness, might be related to heightened mindfulness and perceptual clarity, associated with enhanced articulation. Mindful observing, marked by a non-judgmental and non-evaluative approach to thoughts, emotions, and experiences, significantly associated with describing personal experiences with precision. Developing these facets of mindfulness might be associated with improved description of experiences and greater awareness of one's internal world. This finding highlights the importance of conducting further research to explore and expand our understanding of the complex relationship between these variables for individuals' internal growth.

Besides the expected outcomes discussed earlier, there are several novel findings regarding emotion regulation from the study that are worth noting. The first unexpected finding from this study is that non-judging has emerged as a key parental factor in our network analysis, revealing itself as a significant influence on various aspects of mindfulness. Its pivotal role suggests that a non-judgmental attitude serves as a protective factor for

emotion regulation and holds substantial value in supporting other facets of mindfulness. Notably, non-judging exhibits a positive association with both acting with awareness and the ability to describe. Firefighters who adopt a non-judgmental stance may show greater awareness in their actions and an enhanced ability to articulate and express their internal experiences. Furthermore, the analysis suggested that a non-judgmental approach might be related to increased comfort and openness in acknowledging and describing one's thoughts and feelings. This lack of judgment creates an atmosphere of acceptance and awareness, enabling firefighters to explore and articulate their internal experiences without the fear of criticism. However, our findings also indicated that a non-judgmental attitude could be associated with challenges in maintaining a detached and objective observation of one's thoughts and feelings. This reflects that firefighters with a strong non-judgmental attitude might face difficulties in maintaining a detached and objective observation of their thoughts and feelings.

Interestingly, our graph further reveals a different dynamic – being more observing is linked to greater non-reactivity. This mechanism of mindfulness may relate to a sense of detachment and perspective-taking, potentially enhancing the ability to observe experiences without an immediate reactive response. Building on this, Lecuona et al. (2021) conducted a comprehensive assessment of the Five Facet Mindfulness Questionnaire (FFMQ) using network analysis. They discovered a notable connection between the 'observing' and 'non-reacting' facets, essentially measuring a similar contemplative mindset. This mindset is characterized by maintaining a calm and non-reactive attitude towards various experiences, including sensations, thoughts, emotions, and sounds. The suggested interpretation is that the items in these aspects relate to a contemplative mindset, acknowledging the impermanent nature of experiences. This could diminish attachment and may be associated with improved non-reactivity, potentially contributing to an increased sense of equanimity and composure

when confronted with difficult or distressing circumstances (Uusberg et al., 2016). Therefore, while a non-judgmental attitude may present challenges in objective observation, the interconnectedness between observing and non-reactivity reveals a nuanced interplay within the broader context of mindfulness.

Expanding on the concept of non-judging, a non-judgmental attitude plays a crucial role in supporting the ability to act with awareness. This attitude creates an atmosphere of acceptance, a vital foundation that empowers individuals to approach their internal experiences with compassion and understanding. As highlighted by Lutz et al. (2014), acting with awareness, according to this perspective, entails being fully present and attentive without the burden of judgment or criticism. The essence of acceptance in this context aligns with Kabat-Zinn's concept of mindfulness as initially proposed by Kabat-Zinn in 1990 and 1994. This concept emphasizes intentional and mindful engagement with present-moment activities, encouraging individuals to be fully present without the interference of judgment or criticism. This principle is at the core of mindfulness-based interventions (MBIs), where numerous studies consistently reveal that practicing awareness and acceptance predicts sustained improvements in mindfulness and overall mental well-being over time.

For example, in therapeutic approaches like DBT developed by Linehan in 1993, mindfulness plays a fundamental role as a central element of personal transformation, highlighting the fostering of mindfulness and openness (Eeles & Walker, 2022). The objective of DBT techniques is to support individuals in elevating their consciousness of their internal states and nurturing more adept reactions to difficult emotions and circumstances. Within the DBT framework, the mindfulness component seeks to enable individuals to observe their thoughts and emotions without passing judgment. Initially, the emphasis is on learning to articulate these experiences, which could contribute to the cultivation of heightened awareness and acceptance (Linehan, 2014). Overall, DBT focuses on the

development and enhancement of mindfulness skills as a means of promoting emotional regulation and reducing psychological distress and the FMMQ was tailored to measure such outcomes.

However, our directional network analysis demonstrated that describing is the predictor of mindfulness, but it rather appears as an outcome from interactions of other mindfulness facets. Our findings extend the directional network analysis of the FFMQ by Heeren et al. (2021). In their study, the arrangement of each facet within DAG is viewed as resulting from the conditional distribution of each facet, given its 'parent' facets in the model. This approach is key to understanding how different aspects of mindfulness interrelate in our study. Whereas in our study, the assignment of predictors and outcomes in the DAGs is based on theoretical reasoning and existing empirical evidence, rather than being arbitrary or purely data-driven. Heeren et al. (2021) identified acting with awareness as a primary or parental node, indicating that other facets, like describing, may depend on it. In other words, those who score high in acting with awareness tend to also score high in describing. While this specific finding does not completely align with our results, our study also identifies a directional relationship between acting with awareness and describing. However, in our network analysis, non-judging emerged as a parent node. Our findings suggest that a non-judgmental attitude may support the development of acting with awareness, particularly within the context of firefighting. Being present and attentive seems to be a fundamental aspect of mindfulness that supports the development of other facets, like describing. Relating back to core concept of the Mindfulness-to-Meaning Theory (MMT; Garland et al., 2015), non-judging allows individuals to step back from stress appraisals and approach their experiences with greater awareness. This decentring fosters a broader perspective and can lead to more adaptive emotion regulation and resilience. This indicates that within the unique context of firefighting, non-judging may play a crucial role in enhancing overall mindfulness,

perhaps more so than in general populations. The findings hold noteworthy implications across various fields, as their relevance and potential contributions extend far and wide.

Moreover, the directional graph revealed the association between emotion regulation difficulties, demonstrated that firefighters' inability to achieve their goals and strategies for attaining them, potentially leading to a nonaccepting attitude. Encountering challenges and setbacks in both accessing effective emotion regulation strategies and while striving towards goals often evokes feelings of frustration, disappointment, and a sense of failure (Höpfner & Keith, 2021). These negative experiences or perceived failures in managing emotions and achieving desired outcomes may relate to a nonaccepting attitude, where high-stress professions find it challenging to acknowledge and embrace their current circumstances or the outcomes they have attained. Thus, these results highlighted the importance of addressing both aspects in interventions aimed at promoting adaptive coping strategies and enhancing resilience in the face of adversity.

Another significant finding discovered is that the inability to achieve goals and the lack of supporting strategies are associated with emotional clarity. When firefighters struggle to accomplish their goals or face obstacles without effective strategies, it can create confusion and uncertainty, which may be related to a diminished understanding of their own emotions. According to the process model of emotion regulation (Gross, 2015), the lack of effective antecedent-focused strategies, such as reappraisal, which are crucial for managing emotions before they fully develop, may be associated with increased reliance on less adaptive response-focused strategies, such as emotional suppression. This impaired emotional clarity is associated with challenges in observing and describing their inner experiences (alexithymia) accurately (Halpern et al., 2012). When individuals lack clarity about their emotions, it becomes challenging for them to objectively describe their thoughts, feelings, and sensations. This lack of clarity creates a barrier to effectively engage with and understand their own inner

world. Therefore, the inability to achieve goals and the absence of supporting strategies are linked to reduced emotional clarity and challenges in describing individual experiences. This interconnected relationship highlights the importance of developing goal-oriented strategies and enhancing emotional clarity may be important for self-awareness and understanding.

Furthermore, it is found that the absence of effective emotion regulation strategies is associated with goal-directed behaviours. This association is linked to increased impulsivity, which is also related to alcohol use (McGlinchey et al., 2022). Weiss et al. (2015) found that individuals lacking supportive emotion regulation strategies may experience emotional challenges, which are associated with difficulties in maintaining focus, resisting distractions, and pursuing goals. The frustration and disappointment associated with goal non-attainment that arises from the limited access of strategies for managing emotion, are associated with impulsive behaviours (Miller & Racine, 2020). This finding holds significant implications for high-risk professions, including firefighters and military veterans who often encounter life-threatening emergencies and high-stress situations. Interventions aimed at addressing the underlying factors that hinder goal-directed behaviours could play a crucial role in mitigating risks and improving overall psychological outcomes in firefighting operations.

Lastly, an additional novel finding arising from the study is that limited access to relevant emotional regulation strategies is associated with a notable impact on the overall network. This finding is supported by the estimated directional graph and the predictability plot, which demonstrates its capacity to explain a greater amount of variance compared to other factors considered. Supported by goals, which is the next important variable, the availability and effectiveness of emotional regulation strategies are associated with influencing the dynamics of the overall network. Limited access to these strategies is associated with a greater impact on emotion regulation and outcomes compared to other

factors that were investigated. The predictability plot serves as supporting evidence, visually representing the magnitude of this influence compared to other variables.

Overall, in examining our results, it is found that the theories may not directly address the specific findings, however it could potentially be relevant in understanding and interpreting the results. Including the stress sensitization theory proposed by Post (1992), is partially supported by the results, showing that firefighters who lack of goal-maintained behaviours and relevant emotion regulation strategies are more likely to experience higher impulsivity as demonstrated in the directional graph. Furthermore, the observed patterns in our results are consistent with the principles outlined in the Monitor and Acceptance theory (Lindsay & Creswell, 2017), such as the crucial role of non-judgmental observation, acceptance of emotions, and acting with awareness for effective emotion regulation. Lastly, utilizing network analysis in this study allowed for the examination of variables and revealed their interactive network, offering a novel perspective on psychopathology. The Network Theory of Psychopathology, proposed by Borsboom (2017), highlights the intricate connections between symptoms, offering insights into how they interact and contribute to psychopathology. These theories deepen our understanding of psychological functioning and offer avenues for further exploration and intervention development.

Limitations and Directions for Future Research

While the current study offers insightful findings into the interplay between facets of mindfulness and emotion regulation, several limitations warrant discussion and provide direction for future research. This study relied on secondary data collected from a large urban fire department in the United States. The original data collection objectives might not have fully aligned with the specific aims of this research, potentially affecting the relevance and precision of our findings. Additionally, the firefighting culture in the U.S. may differ from that in New Zealand, which affects the generalizability of the results outside the U.S. context.

For instance, variations in organizational structure, sources of stress, and cultural aspects between U.S. and New Zealand firefighting could impact the interaction between mindfulness and emotion regulation in these groups. This difference could impact how mindfulness and emotion regulation interact in these two populations. Therefore, caution should be exercised when generalizing these results to other contexts, particularly to New Zealand, where factors such as different operational protocols, societal attitudes towards mental health, and support systems might alter the observed relationships. Furthermore, as researchers based in New Zealand, our limited access to local firefighters further complicates this, as the data could not be directly collected from the population that we are more interested in. To address this in future research, studies should consider primary data collection in contexts, which focus specifically on New Zealand firefighters to better understand the underlying mechanism of mindfulness and emotion regulation in that unique environment. Developing and testing interventions tailored to this context could also be a valuable next step. This would further address the potential practical implications of the research and offer actionable insights for improving mental health outcomes in firefighters globally.

The nature of the cross-sectional data used in this study, common to many investigations, restricts the ability to observe changes over time or establish causality. The application of both BGGM and directional networks to such data can elucidate potential relationships and correlations but makes it challenging to infer the temporal order of variables or causal directionality. Future studies employing longitudinal designs would provide a more robust basis for examining the progression and causal relationships between these variables. There were no standardized measures that assessment resilience, PTSD, generalized anxiety, depression, and suicidality which has been used in previous first responder network studies (Ponder et al., 2023).

It is important to consider the limitations and challenges associated with analysing data and interpreting results. Without a comprehensive timeline and complete information, drawing accurate conclusions can be akin to solving a mystery with insufficient clues. The presence of correlations does not necessarily imply meaningful relationships and can be influenced by hidden variables. Complex methodologies like BGGM and directional networks further complicate the task of unravelling the true connections between variables, resembling the challenge of cracking a safe without the correct combination. Additionally, these techniques require a substantial sample size to generate reliable and valid outcomes. Drawing an analogy, examining only a limited subset of the data is comparable to appreciating merely a fraction of a masterpiece, risking the omission of crucial details. In our study, our scope was restricted to firefighters and military veterans, necessitating the inclusion of a more extensive and diverse participant cohort to ensure the reliability and robustness of the findings. Future research should strive to encompass a broader range of participants, fostering increased generalizability and yielding a more comprehensive comprehension of the phenomenon being investigated.

Another potential hiccup is multicollinearity. If the variables in our dataset are as entangled as vines, it could skew our BGGM and directional network analyses, throwing off their accuracy. It is akin to trying to discern individual voices in a bustling crowd - if they are too similar, it is a tough job to distinguish them. In addition, like any observational study, we could not establish the rigorous control that we could have in a lab experiment. This could make our findings vulnerable to confounding factors and bias. Therefore, future research should use longitudinal data to advance our understanding of the complexities of the network. By doing so, future research should be better equipped to untie the complex knot of relationships between mindfulness facets and emotion regulation, which could lead us to more effective interventions.

Despite these limitations, the findings of this study provide various practical applications. The study discovered that mindfulness practices are effective in regulating emotions, which can be applied to both firefighter training programs and mental health interventions. Mindfulness practices could be integrated into training programs to encourage present-moment mindfulness, nonjudgmental observation, and emotional regulation under stress. Furthermore, mental health interventions may use mindfulness-based stress reduction (MBSR) or cognitive-behavioural tools to boost emotional resilience and clarity. Implementing these techniques may help firefighters avoid burnout, enhance mental health, and improve their overall emotional wellness. Additionally, the findings may impact policymakers that increase mental health support for first responders. Policymakers may utilise this knowledge to encourage the incorporation of mindfulness training and emotion management tools into mainstream wellness programs. This could entail including mindfulness techniques into regular training schedules and offering continuous support tools. To build on these findings, future research should look into how beneficial mindfulness-based interventions are in firefighting and military settings. Studies could look into their effects on mental health, job performance, and overall well-being. Also, research should examine how cultural and operational factors may influence the effectiveness of these programs in various settings.

In conclusion, the study's findings underscore the integral role of mindfulness, specifically the facets of acting with awareness and non-judgmental attitude, in promoting better emotion regulation. These results point towards a novel perspective in understanding and addressing the emotional challenges faced by firefighters and military veterans, where the cultivation of these specific mindfulness facets could potentially serve as protective factors against emotional dysregulation and detrimental behaviours such as alcohol abuse.

References

- Adan, A., Forero, D. A., & Navarro, J. F. (2017). Personality traits related to binge drinking: A systematic review. *Frontiers in Psychiatry, 8*.
<https://doi.org/10.3389/fpsy.2017.00134>
- Åkerblom, S., Cervin, M., Perrin, S., Rivano Fischer, M., Gerdle, B., & McCracken, L. M. (2021). A network analysis of clinical variables in chronic pain: A study from the Swedish Quality Registry for Pain Rehabilitation (SQRP). *Pain Medicine, 22*(7), 1591–1602. <https://doi.org/10.1093/pm/pnaa473>
- Azizi, Z., Jandaghi, G., Firoozi, M., Zia-Tohidi, A., & Ebnerasouli, S. (2022). The relative importance of mindfulness facets and their interactions: Relations to psychological symptoms in chronic pain. *Mindfulness, 13*(4), 1054–1068.
<https://doi.org/10.1007/s12671-022-01862-2>
- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13*(1), 27–45.
<https://doi.org/10.1177/1073191105283504>
- Barcaccia, B., Cervin, M., Pozza, A., Medvedev, O. N., Baiocco, R., & Pallini, S. (2020). Mindfulness, self-compassion and attachment: A network analysis of psychopathology symptoms in adolescents. *Mindfulness, 11*(11), 2531–2541.
<https://doi.org/10.1007/s12671-020-01466-8>
- Barré, T., Ramier, C., Mounir, I., David, R., Menvielle, L., Marcellin, F., Carrieri, P., Protopopescu, C., & Cherikh, F. (2022). Mindfulness as a protective factor against increased tobacco and alcohol use in hospital workers following the first COVID-19-related lockdown: A study in southern France. *International Journal of Mental Health and Addiction*. <https://doi.org/10.1007/s11469-021-00739-0>

- Bartlett, B. A., Smith, L. J., Tran, J. K., & Vujanovic, A. A. (2018). Understanding mental health among military veterans in the fire service. *Psychiatry Research*, *267*, 394–399. <https://doi.org/10.1016/j.psychres.2018.06.020>
- Bartlett, B. A., Smith, L. J., Lebeaut, A., Tran, J. K., & Vujanovic, A. A. (2019). PTSD symptom severity and impulsivity among firefighters: Associations with alcohol use. *Psychiatry Research*, *278*, 315–323. <https://doi.org/10.1016/j.psychres.2019.06.039>
- Bartos, L. J., Posadas, M. P., Wrapson, W., & Krägeloh, C. (2023). Increased effect sizes in a mindfulness- and yoga-based intervention after adjusting for response shift with then-test. *Mindfulness*, *14*(4), 953–969. <https://doi.org/10.1007/s12671-023-02102-x>
- Bjureberg, J., Ljótsson, B., Tull, M. T., Hedman, E., Sahlin, H., Lundh, L.-G., Bjärehed, J., DiLillo, D., Messman-Moore, T., Gumpert, C. H., & Gratz, K. L. (2016). Development and validation of a brief version of the difficulties in emotion regulation scale: The DERS-16. *Journal of Psychopathology and Behavioral Assessment*, *38*(2), 284–296. <https://doi.org/10.1007/s10862-015-9514-x>
- Borsboom, D. (2017). A network theory of mental disorders. *World Psychiatry*, *16*(1), 5–13. <https://doi.org/10.1002/wps.20375>
- Borsboom, D., Deserno, M. K., Rhemtulla, M., Epskamp, S., Fried, E. I., McNally, R. J., Robinaugh, D. J., Perugini, M., Dalege, J., Costantini, G., Isvoranu, A.-M., Wysocki, A. C., van Borkulo, C. D., van Bork, R., & Waldorp, L. J. (2021). Network analysis of multivariate data in psychological science. *Nature Reviews Methods Primers*, *1*(1). <https://doi.org/10.1038/s43586-021-00055-w>
- Boudreaux, M. J., & Ozer, D. J. (2013). Goal conflict, goal striving, and psychological well-being. *Motivation and Emotion*, *37*(3), 433–443. <https://doi.org/10.1007/s11031-012-9333-2>

- Bradizza, C. M., Brown, W. C., Ruszczyk, M. U., Dermen, K. H., Lucke, J. F., & Stasiewicz, P. R. (2018). Difficulties in emotion regulation in treatment-seeking alcoholics with and without co-occurring mood and anxiety disorders. *Addictive Behaviors, 80*, 6–13. <https://doi.org/10.1016/j.addbeh.2017.12.033>
- Brummer, J., Bloomfield, K., Karriker-Jaffe, K. J., Pedersen, M. M., & Hesse, M. (2022). Using the alcohol use disorders identification test to predict hospital admission for alcohol-related conditions in the Danish general population: a record-linkage study. *Addiction, 118*(1), 86–94. <https://doi.org/10.1111/add.16034>
- Chalmers, R. A., Cervin, M., Choo, C., Baune, B. T., Trollor, J. N., Numbers, K., Sachdev, P. S., Brodaty, H., Kochan, N. A., & Medvedev, O. N. (2022). Networks of inflammation, depression, and cognition in aging males and females. *Aging Clinical and Experimental Research, 34*(10), 2387–2398. <https://doi.org/10.1007/s40520-022-02198-6>
- Chalmers, R. A., Cervin, M., & Medvedev, O. N. (2022). Network analysis. *Handbook of Assessment in Mindfulness Research*, 1–16. https://doi.org/10.1007/978-3-030-77644-2_70-1
- Chambers, S. E., Baldwin, D. S., & Sinclair, J. M. A. (2020). Course and outcome of patients with alcohol use disorders following an alcohol intervention during hospital attendance: mixed method study. *BJPsych Open, 7*(1). <https://doi.org/10.1192/bjo.2020.138>
- Christensen, A. P., Golino, H., & Silvia, P. J. (2020). A psychometric network perspective on the validity and validation of personality trait questionnaires. *European Journal of Personality, 34*(6), 1095–1108. <https://doi.org/10.1002/per.2265>

- Christoe-Frazier, L., & Johnson, B. D. (2021). Exploring the effects of interrelated goals, anxiety, and mindfulness on somatic symptoms. *Mindfulness, 12*(8), 1954–1964. <https://doi.org/10.1007/s12671-021-01653-1>
- Csató, L. (2016). Measuring centrality by a generalization of degree. *Central European Journal of Operations Research, 25*(4), 771–790. <https://doi.org/10.1007/s10100-016-0439-6>
- Desrosiers, A., Vine, V., Klemanski, D. H., & Nolen-Hoeksema, S. (2013). Mindfulness and emotion regulation in depression and anxiety: Common and distinct mechanisms of action. *Depression and Anxiety, 30*(7), 654–661. <https://doi.org/10.1002/da.22124>
- Dick, D. M., Smith, G., Olausson, P., Mitchell, S. H., Leeman, R. F., O'Malley, S. S., & Sher, K. (2010). Understanding the construct of impulsivity and its relationship to alcohol use disorders. *Addiction Biology, 15*(2), 217–226. <https://doi.org/10.1111/j.1369-1600.2009.00190.x>
- Digitale, J. C., Martin, J. N., & Glymour, M. M. (2022). Tutorial on directed acyclic graphs. *Journal of Clinical Epidemiology, 142*, 264–267. <https://doi.org/10.1016/j.jclinepi.2021.08.001>
- Eeles, J., & Walker, D. (2022). Mindfulness as taught in dialectical behaviour therapy: A scoping review. *Clinical Psychology & Psychotherapy, 29*(6), 1843–1853. <https://doi.org/10.1002/cpp.2764>
- Fisher, M. E., Duraney, E., Friess, K., Whitmoyer, P., Andridge, R., & Prakash, R. S. (2022). Trait mindfulness and emotion regulation responsiveness to negative affect in daily life. *Mindfulness, 13*(11), 2796–2811. <https://doi.org/10.1007/s12671-022-01996-3>
- Gan, R., Xue, J., & Chen, S. (2023). Do mindfulness-based interventions reduce burnout of college students in China? A randomized controlled trial. *Mindfulness, 14*(4), 880–890. <https://doi.org/10.1007/s12671-023-02092-w>

- Garland, E. L., Farb, N. A., R. Goldin, P., & Fredrickson, B. L. (2015). Mindfulness broadens awareness and builds eudaimonic meaning: A process model of mindful positive emotion regulation. *Psychological Inquiry*, 26(4), 293–314.
<https://doi.org/10.1080/1047840x.2015.1064294>
- Garland, E. L., Farb, N. A., Goldin, P. R., & Fredrickson, B. L. (2015). The Mindfulness-to-Meaning Theory: Extensions, Applications, and Challenges at the Attention–Appraisal–Emotion Interface. *Psychological Inquiry*, 26(4), 377–387.
<https://doi.org/10.1080/1047840x.2015.1092493>
- Garnefski, N., & Kraaij, V. (2007). The Cognitive Emotion Regulation Questionnaire. *European Journal of Psychological Assessment*, 23(3), 141–149.
<https://doi.org/10.1027/1015-5759.23.3.141>
- George, P. G., & Renjith, V. (2021). Evolution of Safety and Security Risk Assessment methodologies towards the use of Bayesian Networks in Process Industries. *Process Safety and Environmental Protection*, 149, 758–775.
<https://doi.org/10.1016/j.psep.2021.03.031>
- Gori, A., Topino, E., Cacioppo, M., Craparo, G., Schimmenti, A., & Caretti, V. (2022). An addictive disorders severity model: a chained mediation analysis using structural equation modeling. *Journal of Addictive Diseases*, 41(1), 98–109.
<https://doi.org/10.1080/10550887.2022.2074762>
- Gratz, K. L., & Roemer, L. (2004). Multidimensional Assessment of Emotion Regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment*, 26(1), 41–54. <https://doi.org/10.1023/b:joba.0000007455.08539.94>

- Gross, J. J. (2015). The Extended Process Model of Emotion Regulation: Elaborations, Applications, and Future Directions. *Psychological Inquiry*, 26(1), 130–137. <https://doi.org/10.1080/1047840x.2015.989751>
- Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, 85(2), 348–362. <https://doi.org/10.1037/0022-3514.85.2.348>
- Guendelman, S., Medeiros, S., & Rampes, H. (2017). Mindfulness and emotion regulation: Insights from neurobiological, psychological, and clinical studies. *Frontiers in Psychology*, 8. <https://doi.org/10.3389/fpsyg.2017.00220>
- Gu, J., Strauss, C., Bond, R., & Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. *Clinical Psychology Review*, 37, 1–12. <https://doi.org/10.1016/j.cpr.2015.01.006>
- Haag, A. C., Cha, C. B., Noll, J. G., Gee, D. G., Shenk, C. E., Schreier, H. M. C., Heim, C. M., Shalev, I., Rose, E. J., Jorgensen, A., & Bonanno, G. A. (2023). The Flexible Regulation of Emotional Expression Scale for Youth (FREE-Y): Adaptation and Validation Across a Varied Sample of Children and Adolescents. *Assessment*, 30(4), 1265–1284. <https://doi.org/10.1177/10731911221090465>
- Haddock, C. K., Jitnarin, N., Caetano, R., Jahnke, S. A., Hollerbach, B. S., Kaipust, C. M., & Poston, W. S. C. (2022). Norms about alcohol use among us firefighters. *Safety and Health at Work*, 13(4), 387–393. <https://doi.org/10.1016/j.shaw.2022.08.008>
- Hammen, C., Henry, R., & Daley, S. E. (2000). Depression and sensitization to stressors among young women as a function of childhood adversity. *Journal of Consulting and Clinical Psychology*, 68(5), 782–787. <https://doi.org/10.1037/0022-006x.68.5.782>

- Halpern, J., Maunder, R. G., Schwartz, B., & Gurevich, M. (2012). Identifying, describing, and expressing emotions after critical incidents in paramedics. *Journal of traumatic stress*, *25*(1), 111–114. <https://doi.org/10.1002/jts.21662>
- Haslbeck, J. M. B., & Waldorp, L. J. (2017). How well do network models predict observations? On the importance of predictability in network models. *Behavior Research Methods*, *50*(2), 853–861. <https://doi.org/10.3758/s13428-017-0910-x>
- Heeren, A., Lannoy, S., Coussement, C., Hoebeke, Y., Verschuren, A., Blanchard, M. A., Chakroun-Baggioni, N., Philippot, P., & Gierski, F. (2021). A network approach to the five-facet model of mindfulness. *Scientific Reports*, *11*(1). <https://doi.org/10.1038/s41598-021-94151-2>
- Herman, A. M., & Duka, T. (2019). Facets of impulsivity and alcohol use: What role do emotions play? *Neuroscience & Biobehavioral Reviews*, *106*, 202–216. <https://doi.org/10.1016/j.neubiorev.2018.08.011>
- Hevey, D. (2018). Network analysis: A brief overview and tutorial. *Health Psychology and Behavioral Medicine*, *6*(1), 301–328. <https://doi.org/10.1080/21642850.2018.1521283>
- Höpfner, J., & Keith, N. (2021). Goal missed, self hit: Goal-setting, goal-failure, and their affective, motivational, and behavioral consequences. *Frontiers in Psychology*, *12*. <https://doi.org/10.3389/fpsyg.2021.704790>
- Huang, F.-Y. (2022). How emotion regulation mediates the relationship between dispositional mindfulness, depression, and complicated grief among the bereaved population. *Mindfulness*, *13*(8), 2092–2100. <https://doi.org/10.1007/s12671-022-01944-1>
- Huth, K. B. S., De Ron, J., Goudriaan, A. E., Luigjes, J., Mohammadi, R., Van Holst, R. J., Wagenmakers, E. J., & Marsman, M. (2023). Bayesian Analysis of Cross-Sectional

- Networks: A Tutorial in R and JASP. *Advances in Methods and Practices in Psychological Science*, 6(4). <https://doi.org/10.1177/25152459231193334>
- Iani, L., Lauriola, M., Chiesa, A., & Cafaro, V. (2018). Associations between mindfulness and emotion regulation: The key role of describing and nonreactivity. *Mindfulness*, 10(2), 366–375. <https://doi.org/10.1007/s12671-018-0981-5>
- IBM Corp. (2020). IBM SPSS Statistics for Windows (Version 27.0) [Computer software]. IBM Corp.
- Ibrahim, H., Ertl, V., Catani, C., Ismail, A. A., & Neuner, F. (2018). The validity of Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5) as screening instrument with Kurdish and Arab displaced populations living in the Kurdistan region of Iraq. *BMC psychiatry*, 18(1), 1-8. <https://doi.org/10.1186/s12888-018-1839-z>
- Jackson, D., Turner, R., Rhodes, K., & Viechtbauer, W. (2014). Methods for calculating confidence and credible intervals for the residual between-study variance in random effects meta-regression models. *BMC Medical Research Methodology*, 14(1). <https://doi.org/10.1186/1471-2288-14-103>
- Jakubczyk, A., Trucco, E. M., Kopera, M., Kobylński, P., Suszek, H., Fudalej, S., Brower, K. J., & Wojnar, M. (2018). The association between impulsivity, emotion regulation, and symptoms of alcohol use disorder. *Journal of Substance Abuse Treatment*, 91, 49–56. <https://doi.org/10.1016/j.jsat.2018.05.004>
- Kabat-Zinn, J. (1990). *Full Catastrophe Living: Using the Wisdom of Your Body and Mind to Face Stress, Pain, and Illness*. Delacorte Press.
- Kabat-Zinn, J. (1994). *Wherever You Go, There You Are: Mindfulness Meditation in Everyday Life*. Hachette Books.
- Kaufman, E. A., Xia, M., Fosco, G., Yaptangco, M., Skidmore, C. R., & Crowell, S. E. (2015). The Difficulties in Emotion Regulation Scale Short Form (DERS-SF):

Validation and Replication in Adolescent and Adult Samples. *Journal of Psychopathology and Behavioral Assessment*, 38(3), 443–455.

<https://doi.org/10.1007/s10862-015-9529-3>

Ketay, S., Thorson, K. R., Roy, A. R., & Welker, K. M. (2023). Trait mindfulness is associated with self-disclosure and responsiveness during social interactions with new acquaintances. *Mindfulness*, 14(1), 205–217. <https://doi.org/10.1007/s12671-022-02044-w>

Kököneyi, G., Urbán, R., Reinhardt, M., Józán, A., & Demetrovics, Z. (2014). The Difficulties in Emotion Regulation Scale: Factor Structure in Chronic Pain Patients. *Journal of Clinical Psychology*, 70(6), 589–600. <https://doi.org/10.1002/jclp.22036>

Korobilis, D., & Shimizu, K. (2022). Bayesian Approaches to Shrinkage and Sparse Estimation. *Foundations and Trends® in Econometrics*, 11(4), 230–354. <https://doi.org/10.1561/08000000041>

Krätzeloh, C. U., Henning, M. A., Medvedev, O. N., Feng, X. J., Moir, F., Billington, R., & Siegert, R. J. (2019). *Mindfulness-based intervention research: Characteristics, approaches, and developments*. Routledge.

Kümmerle, S., Heidenreich, T., & Müller-Engelmann, M. (2023). Beyond mindfulness assessed by questionnaires: The mindful-breathing exercise as an additional approach in PTSD and Depression. *Mindfulness*, 14(4), 919–932. <https://doi.org/10.1007/s12671-023-02093-9>

Lebeaut, A., Tran, J. K., & Vujanovic, A. A. (2020). Posttraumatic stress, alcohol use severity, and alcohol use motives among firefighters: The role of anxiety sensitivity. *Addictive Behaviors*, 106, 106353. <https://doi.org/10.1016/j.addbeh.2020.106353>

Lecuona, O., García-Rubio, C., de Rivas, S., Moreno-Jiménez, J. E., Meda-Lara, R. M., & Rodríguez-Carvajal, R. (2021). A network analysis of the five facets mindfulness

- questionnaire (FFMQ). *Mindfulness*, 12(9), 2281–2294.
<https://doi.org/10.1007/s12671-021-01704-7>
- Lecuona, O., García-Rubio, C., de Rivas, S., Moreno-Jiménez, J. E., & Rodríguez-Carvajal, R. (2022). Unraveling heterogeneities in Mindfulness Profiles: A review and latent profile analysis of the five facet mindfulness questionnaire short-form (FFMQ-SF) in the Spanish population. *Mindfulness*, 13(8), 2031–2046.
<https://doi.org/10.1007/s12671-022-01939-y>
- Leonard, S. J., & Vujanovic, A. A. (2022). Thwarted belongingness and PTSD symptom severity among firefighters: The role of emotion regulation difficulties. *Behavior Modification*, 46(2), 352–373. <https://doi.org/10.1177/01454455211002105>
- Linehan, M. M. (1993). *Cognitive-behavioral treatment of borderline personality disorder*. Guilford Press.
- Linehan, M. M. (1993). *Skills training manual for treating borderline personality disorder*. Guilford press.
- Linehan, M. (2014). *DBT? Skills training manual*. Guilford Publications.
- Lindsay, E. K., & Creswell, J. D. (2017). Mechanisms of mindfulness training: Monitor and acceptance theory (MAT). *Clinical Psychology Review*, 51, 48–59.
<https://doi.org/10.1016/j.cpr.2016.10.011>
- Lindsay, E. K., & Creswell, J. D. (2019). Mindfulness, acceptance, and emotion regulation: perspectives from Monitor and Acceptance Theory (MAT). *Current Opinion in Psychology*, 28, 120–125. <https://doi.org/10.1016/j.copsyc.2018.12.004>
- Liu, H., Ni, Y., Xie, H., Xie, Y., Fan, C., Li, Y., Shen, W., Zhai, H., Jiang, C., Wu, J., & Wu, H. (2024). The network and interactive pattern of social adjustment and psychological symptoms in patients with spinal cord injury: A network analysis. *Research Square (Research Square)*. <https://doi.org/10.21203/rs.3.rs-4306663/v1>

- López-Pernas, S., Gordillo, A., Barra, E., & Saqr, M. (2024). The Dynamics of Students' Playing Profiles in a Programming Educational Escape Room. In *Lecture notes in educational technology* (pp. 21–31). https://doi.org/10.1007/978-981-97-1814-6_2
- Lutz, J., Herwig, U., Opialla, S., Hittmeyer, A., Jäncke, L., Rufer, M., Grosse Holtforth, M., & Brühl, A. B. (2014). Mindfulness and emotion regulation—an fMRI study. *Social Cognitive and Affective Neuroscience*, *9*(6), 776–785. <https://doi.org/10.1093/scan/nst043>
- Makara-Studzińska, M., Golonka, K., & Izydorczyk, B. (2019). Self-efficacy as a moderator between stress and professional burnout in firefighters. *International Journal of Environmental Research and Public Health*, *16*(2), 183. <https://doi.org/10.3390/ijerph16020183>
- McBride, E. E., Chin, G. R., Clauser, K. S., & Greeson, J. M. (2022). Perceived stress mediates the relationship between trait mindfulness and physical symptoms of stress: A replication study using structural equation modeling. *Mindfulness*, *13*(8), 1923–1930. <https://doi.org/10.1007/s12671-022-01928-1>
- McGlinchey, E., Ross, J., Murphy, D., Shorter, G. W., & Armour, C. (2022). Disentangling the Symptom-Level Nuances in Comorbid Posttraumatic Stress Disorder and Problematic Alcohol Use in Northern Irish Military Veterans: A Network Analysis. *Journal of traumatic stress*, *35*(1), 32–41. <https://doi.org/10.1002/jts.22666>
- Medvedev, O. N., Siegert, R. J., Kersten, P., & Krägeloh, C. U. (2017). Improving the precision of the five facet mindfulness questionnaire using a rasch approach. *Mindfulness*, *8*(4), 995–1008. <https://doi.org/10.1007/s12671-016-0676-8>
- Medvedev, O. N., Cervin, M., Barcaccia, B., Siegert, R. J., Roemer, A., & Krägeloh, C. U. (2021). Network analysis of mindfulness facets, affect, compassion, and distress. *Mindfulness*, *12*(4), 911–922. <https://doi.org/10.1007/s12671-020-01555-8>

- Miloslavich, K., Leonard, S. J., Wardle, M. C., & Vujanovic, A. A. (2023). Alcohol use severity, anger and drinking motives among firefighters. *Substance Use & Misuse*, 58(5), 601–609. <https://doi.org/10.1080/10826084.2023.2177113>
- Miller, A. E., & Racine, S. E. (2020). Emotion regulation difficulties as common and unique predictors of impulsive behaviours in university students. *Journal of American College Health*, 70(5), 1387–1395. <https://doi.org/10.1080/07448481.2020.1799804>
- Okafor, G. N., Ford, B. Q., Antonoplis, S., Reina, A. M., Lutfeali, S., & Shallcross, A. J. (2023). Measuring mindfulness in Black Americans: A psychometric validation of the five facet mindfulness questionnaire. *Mindfulness*, 14(3), 565–581. <https://doi.org/10.1007/s12671-023-02072-0>
- OpenAI. (2023). *ChatGPT* (Mar 14 version) [Large language model]. <https://chat.openai.com/chat>
- Park, H., Kim, J. I., Min, B., Oh, S., & Kim, J.-H. (2019). Prevalence and correlates of suicidal ideation in Korean firefighters: A nationwide study. *BMC Psychiatry*, 19(1). <https://doi.org/10.1186/s12888-019-2388-9>
- Ponder, W. N., Walters, K., Simons, J., Simons, R., Jetelina, K. K., & Carbajal, J. (2023). Network analysis of distress, suicidality, and resilience in a treatment seeking sample of first responders. *Journal of Affective Disorders*, 320, 742-750. <https://doi.org/10.1016/j.jad.2022.09.097>
- Post, R. M. (1992). Transduction of psychosocial stress into the neurobiology of recurrent affective disorder. *American Journal of Psychiatry*, 149(8), 999–1010. <https://doi.org/10.1176/ajp.149.8.999>
- Raudales, A. M., Short, N. A., & Schmidt, N. B. (2019). Emotion dysregulation mediates the relationship between trauma type and PTSD symptoms in a diverse trauma-exposed

- clinical sample. *Personality and Individual Differences*, 139, 28–33.
<https://doi.org/10.1016/j.paid.2018.10.033>
- Roemer, A., Cervin, M., Medvedeva, A., Bravo, A. J., & Medvedev, O. N. (2023). Big Five of Mindfulness and Personality: Cross-Cultural Network Analysis. *Mindfulness*, 1-11.
<https://doi.org/10.1007/s12671-023-02293-3>
- Roemer, L., Williston, S. K., & Rollins, L. G. (2015). Mindfulness and emotion regulation. *Current Opinion in Psychology*, 3, 52–57.
<https://doi.org/10.1016/j.copsyc.2015.02.006>
- Roos, C. R., Pearson, M. R., & Brown, D. B. (2015). Drinking motives mediate the negative associations between mindfulness facets and alcohol outcomes among college students. *Psychology of Addictive Behaviors*, 29(1), 176–183.
<https://doi.org/10.1037/a0038529>
- Rowland, T., Pike, T., Reaney-Wood, S., Mills, D., & Burman, O. (2023). Using network analysis to detect associations between suspected painful health conditions and behaviour in dogs. *The Veterinary Journal*, 293, 105954.
<https://doi.org/10.1016/j.tvjl.2023.105954>
- RStudio Team (2020). *RStudio: Integrated Development for R*. (Version 2023.03.0+386) RStudio, PBC, Boston, MA. <http://www.rstudio.com/>.
- Rubin, M., Papini, S., Dainer-Best, J., Zaizar, E. D., Smits, J. a. J., & Telch, M. J. (2021). Exploratory and Confirmatory Bayesian Networks Identify the Central Role of Non-judging in Symptoms of Depression. *Mindfulness*, 12(10), 2544–2551.
<https://doi.org/10.1007/s12671-021-01726-1>
- Sarıtaş-Atalar, D., Gençöz, T., & Özen, A. (2015). Confirmatory Factor Analyses of the Difficulties in Emotion Regulation Scale (DERS) in a Turkish Adolescent Sample.

European Journal of Psychological Assessment, 31(1), 12–19.

<https://doi.org/10.1027/1015-5759/a000199>

Sarstedt, M., & Ringle, C. M. (2020). Structural equation models: From paths to networks (Westland 2019). *Psychometrika*, 85(3), 841–844. <https://doi.org/10.1007/s11336-020-09719-0>

Saunders, J. B., Aasland, O. G., Babor, T. F., de la Fuente, J. R., & Grant, M. (1993). Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption-II. *Addiction*, 88(6), 791–804. <https://doi.org/10.1111/j.1360-0443.1993.tb02093.x>

Schuman-Olivier, Z., Trombka, M., Lovas, D. A., Brewer, J. A., Vago, D. R., Gawande, R., Dunne, J. P., Lazar, S. W., Loucks, E. B., & Fulwiler, C. (2020). Mindfulness and behavior change. *Harvard Review of Psychiatry*, 28(6), 371–394.

<https://doi.org/10.1097/hrp.0000000000000277>

Scutari, M., & Nagarajan, R. (2013). Identifying significant edges in graphical models of Molecular Networks. *Artificial Intelligence in Medicine*, 57(3), 207–217.

<https://doi.org/10.1016/j.artmed.2012.12.006>

Selin, K. H. (2003). Test-retest reliability of the alcohol use disorder identification test in a general population sample. *Alcoholism: Clinical & Experimental Research*, 27(9), 1428–1435. <https://doi.org/10.1097/01.alc.0000085633.23230.4a>

Simione, L., & Saldarini, F. (2023). A critical review of the monitor and acceptance theory of mindfulness. *Mindfulness*. <https://doi.org/10.1007/s12671-023-02129-0>

Smid, G. E., van der Velden, P. G., Lensvelt-Mulders, G. J., Knipscheer, J. W., Gersons, B. P., & Kleber, R. J. (2012). Stress sensitization following a disaster: A prospective study. *Psychological Medicine*, 42(8), 1675–1686.

<https://doi.org/10.1017/s0033291711002765>

- Smith, B. W., Ortiz, J. A., Steffen, L. E., Tooley, E. M., Wiggins, K. T., Yeater, E. A., Montoya, J. D., & Bernard, M. L. (2011). Mindfulness is associated with fewer PTSD symptoms, depressive symptoms, physical symptoms, and alcohol problems in urban firefighters. *Journal of Consulting and Clinical Psychology, 79*(5), 613–617.
<https://doi.org/10.1037/a0025189>
- Stamates, A. L., & Lau-Barraco, C. (2020). Momentary patterns of impulsivity and alcohol use: A cause or consequence? *Drug and Alcohol Dependence, 217*, 108246.
<https://doi.org/10.1016/j.drugalcdep.2020.108246>
- Stanley, I. H., Boffa, J. W., Tran, J. K., Schmidt, N. B., Joiner, T. E., & Vujanovic, A. A. (2019). Posttraumatic stress disorder symptoms and mindfulness facets in relation to suicide risk among firefighters. *Journal of Clinical Psychology, 75*(4), 696–709.
<https://doi.org/10.1002/jclp.22748>
- Stappenbeck, C. A., & Fromme, K. (2014). The effects of alcohol, emotion regulation, and emotional arousal on the dating aggression intentions of men and women. *Psychology of Addictive Behaviors, 28*(1), 10–19. <https://doi.org/10.1037/a0032204>
- Strohmaier, S., Jones, F. W., & Cane, J. E. (2020). Effects of length of mindfulness practice on mindfulness, depression, anxiety, and stress: A randomized controlled experiment. *Mindfulness, 12*(1), 198–214. <https://doi.org/10.1007/s12671-020-01512-5>
- Sun, X., Li, X., Huang, J., & An, Y. (2020). Prevalence and predictors of PTSD, depression and posttraumatic growth among Chinese firefighters. *Archives of Psychiatric Nursing, 34*(1), 14–18. <https://doi.org/10.1016/j.apnu.2019.12.007>
- Thomsen, K. R., Callesen, M. B., Hesse, M., Kvamme, T. L., Pedersen, M. M., Pedersen, M. U., & Voon, V. (2018). Impulsivity traits and addiction-related behaviors in youth. *Journal of Behavioral Addictions, 7*(2), 317–330.
<https://doi.org/10.1556/2006.7.2018.22>

- Tokhmetov, A., Lee, V., & Tanchenko, L. (2023). Development of DAG Blockchain Model. *Scientific Journal of Astana IT University*. <https://doi.org/10.37943/16cgoy7609>
- Torre, J. B., & Lieberman, M. D. (2018). Putting feelings into words: Affect labeling as implicit emotion regulation. *Emotion Review*, *10*(2), 116–124. <https://doi.org/10.1177/1754073917742706>
- Truong, V. T. T., Green, C., Pedroza, C., Hwang, L. Y., Rajan, S. S., Suchting, R., Cinciripini, P., Tyndale, R. F., & Lerman, C. (2023). Bayesian regularization to predict neuropsychiatric adverse events in smoking cessation with pharmacotherapy. *BMC Medical Research Methodology*, *23*(1). <https://doi.org/10.1186/s12874-023-01931-7>
- Uusberg, H., Uusberg, A., Talpsep, T., & Paaver, M. (2016). Mechanisms of mindfulness: The dynamics of affective adaptation during open monitoring. *Biological Psychology*, *118*, 94–106. <https://doi.org/10.1016/j.biopsycho.2016.05.004>
- Vago, D. R., & Silbersweig, D. A. (2012). Self-awareness, self-regulation, and self-transcendence (s-art): A Framework for understanding the neurobiological mechanisms of mindfulness. *Frontiers in Human Neuroscience*, *6*. <https://doi.org/10.3389/fnhum.2012.00296>
- Ventura-León, J., Sánchez-Villena, A. R., & Caycho-Rodríguez, T. (2023). Validity evidence and reliability of a subjective well-being scale: A Psychometric Network Analysis. *Trends in Psychology*. <https://doi.org/10.1007/s43076-022-00251-x>
- Vujanovic, A. A., Lebeaut, A., Zegel, M., & Buser, S. (2022). Mindful attention training workshop for firefighters: Design and methodology of a pilot randomized clinical trial. *Contemporary Clinical Trials Communications*, *27*, 100905. <https://doi.org/10.1016/j.conctc.2022.100905>

- Weiss, N. H., Kiefer, R., Goncharenko, S., Raudales, A. M., Forkus, S. R., Schick, M. R., & Contractor, A. A. (2022). Emotion regulation and substance use: A meta-analysis. *Drug and Alcohol Dependence*, *230*, 109131. <https://doi.org/10.1016/j.drugalcdep.2021.109131>
- Weiss, N. H., Sullivan, T. P., & Tull, M. T. (2015). Explicating the role of emotion dysregulation in risky behaviors: A review and synthesis of the literature with directions for future research and clinical practice. *Current Opinion in Psychology*, *3*, 22–29. <https://doi.org/10.1016/j.copsyc.2015.01.013>
- Williams, D., & Mulder, J. (2020). BGGM: Bayesian gaussian graphical models in R. *Journal of Open Source Software*, *5*(51), 2111. <https://doi.org/10.21105/joss.02111>
- Wimmer, L., von Stockhausen, L., & Bellingrath, S. (2019). Improving emotion regulation and mood in teacher trainees: Effectiveness of two mindfulness trainings. *Brain and Behavior*, *9*(9). <https://doi.org/10.1002/brb3.1390>
- Wisener, M., & Khoury, B. (2019). Associations between specific mindfulness facets, self-compassion, internally motivated drinking, and alcohol-related problems. *Mindfulness*, *10*(10), 2073–2081. <https://doi.org/10.1007/s12671-019-01172-0>
- Wisener, M., & Khoury, B. (2020). Is self-compassion negatively associated with alcohol and marijuana-related problems via coping motives? *Addictive Behaviors*, *111*, 106554. <https://doi.org/10.1016/j.addbeh.2020.106554>
- Xia, Y., Sun, H., Liu, T. H., & Ma, Z. (2024). Understanding the relations between personality traits, bullying perpetration, and victimization among Chinese adolescents: a psychological network analysis. *Current Psychology*. <https://doi.org/10.1007/s12144-024-06029-x>
- Yin, Q., Hughes, C. D., & Rizvi, S. L. (2023). Using gimme to model the emotional context of suicidal ideation based on clinical data: From Research to Clinical Practice.

Behaviour Research and Therapy, 171, 104427.

<https://doi.org/10.1016/j.brat.2023.104427>

Zegel, M., Tran, J. K., & Vujanovic, A. A. (2019). Posttraumatic stress, alcohol use, and alcohol use motives among firefighters: The role of distress tolerance. *Psychiatry Research*, 282, 112633. <https://doi.org/10.1016/j.psychres.2019.112633>

Appendix A (Divisional Ethics Approval)

Te Wānanga o Ngā Kete | **Division of Arts,
Law, Psychology & Social Sciences**

The University of Waikato
Private Bag 3105
Hamilton 3240
New Zealand

Te Kura Whatu Oho Mauri
School of Psychology
Dr Oleg Medvedev
Tel: +64 7 837 9212
Email: oleg.medvedev@waikato.ac.nz
www.waikato.ac.nz



THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

Yvonne Chiang
Yvonnechn99@gmail.com

Dr Oleg Medvedev

Te Kura Whatu Oho Mauri
School of Psychology

23 February 2024

Dear Yvonne

Re: **FS2024-05: Network for Mindfulness and Difficulties in Regulating Emotions in Firefighters**

Thank you for submitting an ethics application to the ALPSS Human Research Ethics Committee. We have reviewed your application and the Committee is pleased to offer formal approval for your research activities.

We encourage you to contact the committee should issues arise during your data collection, or should you wish to add further research activities or make changes to your project as it unfolds. We wish you all the best with your research. Thank-you for engaging with the process of Ethical Review.

Kind regards

A handwritten signature in cursive script, appearing to read 'E. Fenner'.

Eileen Fenner
Secretary
Division of Arts, Law, Psychology & Social Sciences Human Research Ethics

Appendix B (IRB Ethics Approval)



DIVISION OF RESEARCH
Institutional Review Boards

APPROVAL OF SUBMISSION

January 11, 2018

Anka Vujanovic

aavujanovic@uh.edu

Dear Anka Vujanovic:

On January 11, 2018, the IRB reviewed the following submission:

Type of Review:	Continuing Review
Title of Study:	Firefighter/EMS Health and Wellness Survey
Investigator:	Anka Vujanovic
IRB ID:	CR00000529
Funding/ Proposed Funding:	None
Award ID:	None
Award Title:	
IND, IDE, or HDE:	None
Documents Reviewed:	• Informed Consent_16404-02.pdf, Category: Consent Form;
Review Category:	Expedited
Committee Name:	Not Applicable
IRB Coordinator:	Alicia Vargas

The IRB has granted continuing approval for this study from January 11, 2018 to January 10, 2019, inclusive.

To ensure continuous approval for studies with a review category of "Committee Review" in the above table, you must submit a continuing review with required explanations by the deadline for the December 2018 meeting. These deadlines may be found on the compliance website (<http://www.uh.edu/research/compliance/>). You can submit a continuing review by navigating to the active study and clicking "Create Modification/CR."

For expedited and exempt studies, a continuing review should be submitted no later than 30 days prior to study closure.

If continuing review approval is not granted on or before January 10, 2019, approval of this study expires and all research (including but not limited to recruitment, consent, study procedures, and analysis of identifiable data) must stop. If the study expires and you believe the welfare of the subjects to be at risk if research procedures are discontinued, please contact the IRB office immediately.

Unless a waiver has been granted by the IRB, use the stamped consent form approved by the IRB to document consent. The approved version may be downloaded from the documents tab.

In conducting this study, you are required to follow the requirements listed in the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library within the IRB system.

Sincerely,

UNIVERSITY of
HOUSTON

DIVISION OF RESEARCH
Institutional Review Boards

Office of Research Policies, Compliance and Committees (ORPCC)
University of Houston, Division of Research
713 743 9204
cphs@central.uh.edu
<http://www.uh.edu/research/compliance/irb-cphs/>

Appendix C (FFMQ)

Five Facet Mindfulness Questionnaire (FFMQ)

Please rate each of the following statements with the number that best describes <i>your own opinion</i> of what is <i>generally true for you</i> .		Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
FFQM 1	When I'm walking, I deliberately notice the sensations of my body moving. (OBS)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 2	I'm good at finding words to describe my feelings. (D)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 3	I criticize myself for having irrational or inappropriate emotions. (NJ-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 4	I perceive my feelings and emotions without having to react to them. (NR)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 5	When I do things, my mind wanders off and I'm easily distracted. (AA-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 6	When I take a shower or bath, I stay alert to the sensations of water on my body. (OBS)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 7	I can easily put my beliefs, opinions, and expectations into words. (D)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 8	I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted. (AA-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 9	I watch my feelings without getting lost in them. (NR)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 10	I tell myself I shouldn't be feeling the way I'm feeling. (NJ-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 11	I notice how foods and drinks affect my thoughts, bodily sensations, and emotions. (OBS)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 12	It's hard for me to find the words to describe what I'm thinking. (D-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 13	I am easily distracted. (AA-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 14	I believe some of my thoughts are abnormal or bad and I shouldn't think that way. (NJ-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 15	I pay attention to sensations, such as the wind in my hair or sun on my face. (OBS)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 16	I have trouble thinking of the right words to express how I feel about things. (D-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 17	I make judgments about whether my thoughts are good or bad. (NJ-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 18	I find it difficult to stay focused on what's happening in the present. (AA-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1

		Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
FFQM 19	When I have distressing thoughts or images, I “step back” and am aware of the thought or image without getting taken over by it. (NR)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 20	I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing. (OBS)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 21	In difficult situations, I can pause without immediately reacting. (NR)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 22	When I have a sensation in my body, it’s difficult for me to describe it because I can’t find the right words. (D-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 23	It seems I am “running on automatic” without much awareness of what I’m doing. (AA-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 24	When I have distressing thoughts or images, I feel calm soon after. (NR)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 25	I tell myself that I shouldn’t be thinking the way I’m thinking. (NJ-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 26	I notice the smells and aromas of things. (OBS)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 27	Even when I’m feeling terribly upset, I can find a way to put it into words. (D)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 28	I rush through activities without being really attentive to them. (AA-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 29	When I have distressing thoughts or images, I am able just to notice them without reacting. (NR)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 30	I think some of my emotions are bad or inappropriate and I shouldn’t feel them. (NJ-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 31	I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow. (OBS)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 32	My natural tendency is to put my experiences into words. (D)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 33	When I have distressing thoughts or images, I just notice them and let them go. (NR)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 34	I do jobs or tasks automatically without being aware of what I’m doing. (AA-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 35	When I have distressing thoughts or images, I judge myself as good or bad depending what the thought or image is about. (NJ-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 36	I pay attention to how my emotions affect my thoughts and behavior. (OBS)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

		Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
FFQM 37	I can usually describe how I feel at the moment in considerable detail. (D)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
FFQM 38	I find myself doing things without paying attention. (AA-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
FFQM 39	I disapprove of myself when I have irrational ideas. (NJ-R)	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1

Scoring:

(Note: R = reverse-scored item)

Subscale Directions	Your Score TOTAL	Your score item Avg.
Observing: Sum items 1 + 6 + 11 + 15 + 20 + 26 + 31 + 36		
Describing: Sum items 2 + 7 + 12R + 16R + 22R + 27 + 32 + 37.		
Acting with Awareness: Sum items 5R + 8R + 13R + 18R + 23R + 28R + 34R + 38R.		
Nonjudging of inner experience: Sum items 3R + 10R + 14R + 17R + 25R + 30R + 35R + 39R.		
Nonreactivity to inner experience: Sum items 4 + 9 + 19 + 21 + 24 + 29 + 33.		
TOTAL FFMQ (add subscale scores)		

NOTE: Some researchers divide the total in each category by the number of items in that category to get an average category score. The Total FFMQ can be divided by 39 to get an average item score.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, 13(1), 27-45.

Appendix D (DERS)

Difficulties in Emotion Regulation Scale (DERS)

Please indicate how often the following statements apply to you by writing the appropriate number from the scale below on the line beside each item.

	1-----2-----3-----4-----5
	almost never sometimes about half the time most of the time almost always
	(0-10%) (11-35%) (36-65%) (66-90%) (91-100%)
_____ 1) I am clear about my feelings.	
_____ 2) I pay attention to how I feel.	
_____ 3) I experience my emotions as overwhelming and out of control.	
_____ 4) I have no idea how I am feeling.	
_____ 5) I have difficulty making sense out of my feelings.	
_____ 6) I am attentive to my feelings.	
_____ 7) I know exactly how I am feeling.	
_____ 8) I care about what I am feeling.	
_____ 9) I am confused about how I feel.	
_____ 10) When I'm upset, I acknowledge my emotions.	
_____ 11) When I'm upset, I become angry with myself for feeling that way.	
_____ 12) When I'm upset, I become embarrassed for feeling that way.	
_____ 13) When I'm upset, I have difficulty getting work done.	
_____ 14) When I'm upset, I become out of control.	
_____ 15) When I'm upset, I believe that I will remain that way for a long time.	
_____ 16) When I'm upset, I believe that I will end up feeling very depressed.	
_____ 17) When I'm upset, I believe that my feelings are valid and important.	
_____ 18) When I'm upset, I have difficulty focusing on other things.	
_____ 19) When I'm upset, I feel out of control.	
_____ 20) When I'm upset, I can still get things done.	
_____ 21) When I'm upset, I feel ashamed at myself for feeling that way.	
_____ 22) When I'm upset, I know that I can find a way to eventually feel better.	
_____ 23) When I'm upset, I feel like I am weak.	
_____ 24) When I'm upset, I feel like I can remain in control of my behaviors.	
_____ 25) When I'm upset, I feel guilty for feeling that way.	
_____ 26) When I'm upset, I have difficulty concentrating.	
_____ 27) When I'm upset, I have difficulty controlling my behaviors.	
_____ 28) When I'm upset, I believe there is nothing I can do to make myself feel better.	
_____ 29) When I'm upset, I become irritated at myself for feeling that way.	
_____ 30) When I'm upset, I start to feel very bad about myself.	
_____ 31) When I'm upset, I believe that wallowing in it is all I can do.	
_____ 32) When I'm upset, I lose control over my behavior.	
_____ 33) When I'm upset, I have difficulty thinking about anything else.	
_____ 34) When I'm upset I take time to figure out what I'm really feeling.	
_____ 35) When I'm upset, it takes me a long time to feel better.	
_____ 36) When I'm upset, my emotions feel overwhelming.	

Reverse-scored items (place a subtraction sign in front of them) are numbered 1, 2, 6, 7, 8, 10, 17, 20, 22, 24 and 34.

Calculate total score by adding everything up. Higher scores suggest greater problems with emotion regulation.

SUBSCALE SCORING:** The measure yields a total score (SUM) as well as scores on six sub-scales:

1. Nonacceptance of emotional responses (NONACCEPT): 11, 12, 21, 23, 25, 29
2. Difficulty engaging in Goal-directed behavior (GOALS): 13, 18, 20R, 26, 33
3. Impulse control difficulties (IMPULSE): 3, 14, 19, 24R, 27, 32
4. Lack of emotional awareness (AWARENESS): 2R, 6R, 8R, 10R, 17R, 34R
5. Limited access to emotion regulation strategies (STRATEGIES): 15, 16, 22R, 28, 30, 31, 35, 36
6. Lack of emotional clarity (CLARITY): 1R, 4, 5, 7R, 9

Total score: sum of all subscales

**"R" indicates reverse scored item

REFERENCE:

Gratz, K. L. & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the Difficulties in Emotion Regulation Scale. *Journal of Psychopathology and Behavioral Assessment*, 26, 41-54.

Appendix E (DERS-16)

DERS-16

Please indicate how often the following statements apply to you by writing the appropriate number from the scale above (1–5) on the line beside each item.

1-----2-----3-----4-----5
Almost never Sometimes About half the time Most of the time Almost always
0-10% 11-35% 36-65% 66-90% 91-100%

- _____ 1) I have difficulty making sense out of my feelings
- _____ 2) I am confused about how I feel.
- _____ 3) When I am upset, I have difficulty getting work done.
- _____ 4) When I am upset, I become out of control.
- _____ 5) When I am upset, I believe that I will remain that way for a long time.
- _____ 6) When I am upset, I believe that I'll end up feeling very depressed.
- _____ 7) When I am upset, I have difficulty focusing on other things.
- _____ 8) When I am upset, I feel out of control.
- _____ 9) When I am upset, I feel ashamed with myself for feeling that way.
- _____ 10) When I am upset, I feel like I am weak.
- _____ 11) When I am upset, I have difficulty controlling my behaviors.
- _____ 12) When I am upset, I believe that there is nothing I can do to make myself feel better.
- _____ 13) When I am upset, I become irritated with myself for feeling that way.
- _____ 14) When I am upset, I start to feel very bad about myself.
- _____ 15) When I am upset, I have difficulty thinking about anything else.
- _____ 16) When I am upset, my emotions feel overwhelming.

Scoring

All subscales are scored so that higher scores reflect greater levels of difficulties in emotion regulation.

Subscales:

Lack of Emotional Clarity (Clarity)

1. I have difficulty making sense out of my feelings.
2. I am confused about how I feel.

Difficulties Engaging in Goal-Directed Behavior Goals (Goals)

3. When I am upset, I have difficulty getting work done
7. When I am upset, I have difficulty focusing on other things.
15. When I am upset, I have difficulty thinking about anything else.

Impulse Control Difficulties (Impulse)

4. When I am upset, I become out of control.
8. When I am upset, I feel out of control.
11. When I am upset, I have difficulty controlling my behaviors.

Limited Access to Effective Emotion Regulation Strategies (Strategies)

5. When I am upset, I believe that I will remain that way for a long time.
6. When I am upset, I believe that I'll end up feeling very depressed.
12. When I am upset, I believe that there is nothing I can do to make myself feel better.
14. When I am upset, I start to feel very bad about myself.
16. When I am upset, my emotions feel overwhelming.

Nonacceptance of Emotional Responses (Nonacceptance)

9. When I am upset, I feel ashamed with myself for feeling that way.
10. When I am upset, I feel like I am weak.
13. When I am upset, I become irritated with myself for feeling that way.

Total score

Clarity + Goals + Impulse + Strategies + Nonacceptance (range 16-80)

Citation: Bjureberg, J., Ljótsson, B., Tull, M. T., Hedman, E., Sahlin, H., Lundh, L.-G., Bjärehed, J., DiLillo, D., Messman-Moore, T., Gumpert, C. H., & Gratz, K.L. (2016). Development and Validation of a Brief Version of the Difficulties in Emotion Regulation Scale: The DERS-16. *Journal of Psychopathology and Behavioral Assessment*, 1–13. <http://doi.org/10.1007/s10862-015-9514-x>

Appendix F (AUDIT)

AUDIT questionnaire

Please circle the answer that is correct for you

1. How often do you have a drink containing alcohol?

- Never
- Monthly or less
- 2-4 times a month
- 2-3 times a week
- 4 or more times a week

2. How many standard drinks containing alcohol do you have on a typical day when drinking?

- 1 or 2
- 3 or 4
- 5 or 6
- 7 to 9
- 10 or more

3. How often do you have six or more drinks on one occasion?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

4. During the past year, how often have you found that you were not able to stop drinking once you had started?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

5. During the past year, how often have you failed to do what was normally expected of you because of drinking?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

6. During the past year, how often have you needed a drink in the morning to get yourself going after a heavy drinking session?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

7. During the past year, how often have you had a feeling of guilt or remorse after drinking?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

8. During the past year, have you been unable to remember what happened the night before because you had been drinking?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

9. Have you or someone else been injured as a result of your drinking?

- No
- Yes, but not in the past year
- Yes, during the past year

10. Has a relative or friend, doctor or other health worker been concerned about your drinking or suggested you cut down?

- No
- Yes, but not in the past year
- Yes, during the past year

Scoring the AUDIT

Scores for each question range from 0 to 4, with the first response for each question (eg never) scoring 0, the second (eg less than monthly) scoring 1, the third (eg monthly) scoring 2, the fourth (eg weekly) scoring 3, and the last response (eg. daily or almost daily) scoring 4. For questions 9 and 10, which only have three responses, the scoring is 0, 2 and 4 (from left to right).

A score of 8 or more is associated with harmful or hazardous drinking, a score of 13 or more in women, and 15 or more in men, is likely to indicate alcohol dependence.

Saunders JB, Aasland OG, Babor TF et al. Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption — II. *Addiction* 1993, 88: 791–803.