Testing the Effectiveness of the ImpACT Me Burnout Intervention for Leaders

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Abstract

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Abstract: Effective evidence-based interventions to support workforces in preventing and reducing burnout are required. A longitudinal, randomized wait-list control study (N = 89 leaders) was conducted to test the effectiveness of a three-week app-based burnout intervention (ImpACT Me) grounded in Acceptance and Commitment Therapy. This was the next iteration of a recent successful burnout intervention (Wellness Leadership Program; Gilin et al., 2023). Overall, the intervention increased self-efficacy related to the workplace factors of burnout in the intervention group compared to the control group, but burnout scores did not significantly change. Therefore, it is possible that the active intervention period did not last long enough and that the content and method of delivery of this intervention through an app is not currently sufficient enough to observe significant changes in burnout within leaders.

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Testing the Effectiveness of the ImpACT Me Burnout Intervention in Leaders

The term "burnout" is no longer a word that individuals are unfamiliar with. Burnout awareness has increased and many know what burnout is, what causes it, and what it can lead to for individual and organizational health. In fact, the World Health Organization added burnout into its International Classification of Diseases in 2019. However, despite this increased awareness, burnout is still an prevalent issue in today's global workforce. For instance, a recent survey conducted in 15 countries found that on average, one in four employees reported symptoms of burnout (Brassey et al., 2022). In addition, with their added pressure and responsibilities such as coaching, guiding, and managing teams, leaders may be a group that is particularly vulnerable to burnout (Membrive-Jimenez et al., 2020). In fact, a recent survey of 20,000 people across 11 countries found that 53% of managers report feeling burned out at work (Microsoft, 2022). Hence, burnout as a global phenomenon is not disappearing.

As a result, effective evidence-based interventions to support workforces in preventing and alleviating symptoms of burnout are required. However, despite burnout interventions demonstrating promising results, many of these programs require individuals to set aside hours of their week to engage with the content of the program (Awa et al., 2010). This may not always be feasible for burned out professionals who are busy with work and personal life, making more efficient but effective burnout interventions needed. Therefore, the primary goal of this study was to test the effectiveness and user engagement levels of an app-based burnout intervention (ImpACT Me) grounded in Acceptance and Commitment Therapy (ACT) in a sample of leaders. This was the next iteration of a recent successful theory-based burnout intervention (Wellness Leadership Program; Gilin et al., 2023), but delivered in a more scalable way.

Burnout

Burnout at work is a concept discussed frequently in both research and practice. It refers to "a prolonged period of psychological strain in response to chronic emotional and interpersonal job stressors" (Maslach et al., 2001, p.397). Burnout is defined by three components: emotional exhaustion, depersonalization, and reduced professional efficacy (Maslach et al., 2001). Emotional exhaustion involves feeling emotionally overextended and exhausted at work (Maslach et al., 2001). Depersonalization, also referred to as cynicism, involves negative and cynical detached responses to others at work (Maslach et al., 2001). Finally, reduced professional efficacy involves someone feeling a loss of efficiency and productivity in their job (Maslach et al., 2001). In the past, the most dominant component of burnout has been considered emotional exhaustion (Maslach & Leiter, 2016), but it is possible depersonalization may be more strongly related to the negative consequences of burnout (Maslach & Leiter, 2008; Leiter & Maslach, 2016). Additionally, in certain professions (e.g., healthcare workers), reduced professional efficacy tends to be the last domain to be observed in leaders suffering from burnout (West et al., 2018). In addition to individual factors that contribute to burnout, studies also show consistent workplace factors that contribute to burnout across professions. Maslach et al. (2012) state that there are six main causes of burnout that hold true across employees and industries: unsustainable workload, perceived lack of control, insufficient reward for effort, lack of supportive community, lack of fairness, and mismatched values and skills.

Research findings show that burnout is associated with a host of individual and organizational consequences. From an individual perspective, higher rates of burnout are associated with various mental health concerns including increased rates of depression, anxiety, and substance abuse (Aloha et al., 2005; Koutsimani et al., 2019; Peterson et al., 2008; Rohland, 2000). Furthermore, burnout can manifest itself as physical symptoms as well, including higher

rates of flu-like symptoms (Acker, 2010), neck and back pain (Peterson et al., 2008), and increased heart rate and blood pressure (De Vente et al., 2003). From an organizational perspective, higher rates of burnout among employees are linked to organizational costs such as increased rates of presenteeism and absenteeism, higher rates of both turnover intention and actual turnover, decreased job performance (Aloha et al., 2008; Philp et al., 2012; Swider & Zimmerman, 2010), reduced commitment to the organization (Burke & Richardson, 2000), and reduced job satisfaction (Maslach et al., 2001). Therefore, addressing burnout at work can benefit both individual employee well-being and the overall functioning, success, and the bottom line of an organization.

Burnout in Leaders

Leaders are an organizational group that can be particularly vulnerable to burnout (Membrive-Jimenez et al., 2020). With the demands, pressures, and role overload they experience while guiding their employees (Sharma, 2002), leaders face unique challenges in the workplace that can impact their stress levels. Burnout in leaders can manifest in a variety of ways that influence their subordinates' work-life, including negative affect (Schaufeli & Buunk, 2003) and reduced leader supportive behaviours (Ten Brummelhuis et al., 2014). Hence, leaders require support to prevent and alleviate burnout.

However, addressing leader burnout does not just benefit the well-being of the leaders themselves. On the contrary, leaders are one of the strongest influences on workplace culture and the overall well-being across their teams and organization (Shanafelt & Noseworthy, 2017). Because of this, there is evidence that burnout can cross over from one individual to another (Bakker et al., 2009; Huang et al., 2016), and the emotions felt by leaders, both positive and negative, can transfer to their employees via emotional contagion (Johnson, 2008). Given

leaders' influence in shaping culture and the work environment through their relationships with staff and their decision-making authority (AACN, 2016), burnout in leaders is likely more "contagious" than a team member's burnout (Bennis & Nanus, 2003). Hence, addressing burnout evidently benefits leaders themselves. However, it can also influence and improve the work environment that they lead, which could have downstream effects on the rest of the organization (Adams et al., 2009). Because of this, leaders can act as a positive or negative role-model for their employees by engaging in activities such as self-care and recharging time to regain resources, or conversely, role-modeling poor work-life balance both of which could have trickle-down effects from leaders to staff (Kelly & Adams, 2018). Therefore, when equipped with the correct knowledge and skills, leaders' self-efficacy can increase (Chiabaru & Marinova, 2005). In turn, this can support their ability to enact organizational change to prevent and alleviate burnout within their workplace. In sum, addressing burnout in leaders can benefit themselves and their employees by creating an environment that promotes self-care and well-being, making it crucial to develop effective burnout interventions targeting leaders.

Burnout Interventions

Several interventions have been implemented in attempt to reduce levels of burnout within organizations, and these interventions vary in approach, content, intervention type, and theoretical foundation (Aloha et al., 2017). In general, burnout interventions have been distinguished as two main types: person-directed and organization-directed (Marine et al., 2006). However, Westermann et al. (2014) added a third approach, combined interventions (organization and person-directed).

Person-directed interventions are the most common approach to addressing burnout (Schaufeli & Buunk, 2003). Typically, they focus on educating individuals on recognizing signs

of burnout and teaching them personal coping skills to combat the stressors they face at work (Awa et al., 2010). These interventions can be delivered through a variety of approaches, including workshops and group training sessions, individual coaching, and counseling (Le Blanc & Schaufeli, 2008). The content of these programs range but include measures such as communication skills training (Cohen & Gagin, 2005), relaxation exercises (Ossebaard, 2000; Van Rhenen et al., 2005), adaptive skill training (Rowe, 2000), cognitive behavioural therapy (Van Dierendonck et al., 2005) and psychotherapy (Salmmela-aro et al., 2004). In their review, Awa et al. (2010) found that 82% of person-directed interventions led to a significant reduction in burnout, but these positive effects were only maintained for a maximum of six months post-intervention. In contrast, through their systematic review, Marine and colleagues (2006) found little evidence that person-directed interventions were effective in reducing burnout in their sample of healthcare workers. Finally, in their meta-analysis, Maricutoiu et al. (2016) reported small significant effects of interventions on general burnout and exhaustion, but null effects on cynicism and professional efficacy. In conclusion, person-directed interventions teach individuals skills such as recognizing burnout warnings signs and coping skills to address burnout, but the results of their effectiveness are extremely inconsistent across the literature, and their impact may not last long-term.

Organization-directed interventions focus on addressing and changing aspects of work procedures including task restructuring, decreasing workload, or increasing job control, but are much less common than person-directed interventions (Awa et al., 2010; Westermann et al., 2014). One reason for this may be because organizational interventions are complex, and they are more timely and expensive to implement (Maslach et al., 2001). The content of organization-directed interventions can also vary but are typically presented as workshops or group sessions

that cover aspects such as job training to reduce ambiguity and increase job control, teamwork training for communication and support, and workload changes (Westermann et al., 2014; Panagioti et el., 2016). Results are inconsistent in terms of the effectiveness of organization-directed interventions and have shown to be both effective (Halbesleban et al., 2006) and inconclusive (Awa et al., 2010). However, successful organization-directed interventions have demonstrated longer lasting positive effects than person-directed interventions (Awa et al., 2010; Westermann et al., 2014). This may be because they target systems-level and organization-wide changes that address root causes of burnout (i.e., unsustainable workload, perceived lack of control, insufficient reward for effort, lack of supportive community, lack of fairness, and mismatched values and skills; Maslach et al., 2012).

One way to deliver an organization-directed intervention is to train leaders on these workplace factors of burnout. By increasing their awareness, knowledge, and self-efficacy related to the key organizational causes of burnout, leaders can learn how to use their influence in a positive way to make impactful changes to the environment of their workplace. This approach can be less complex to implement, making it a more scalable way to address burnout at the organizational level. In sum, organization-directed interventions target aspects of work, but are much less common than person-directed interventions, therefore strong conclusions cannot be made. Their effectiveness varies based on the program; however their effects may last longer than the effects of person-directed interventions when successful.

Lastly, combined interventions address both individual factors (e.g., coping skills) and organizational factors (e.g., reducing workload) that contribute to burnout (Westermann et al., 2014). Like person-directed and organization-directed, the effectiveness of combined interventions is inconsistent, and systematic reviews have shown them to be both effective and

ineffective (Aloha et al., 2017; Awa et al., 2010; Westermann et al., 2014). However, due to the inclusion of organization-directed components within combined interventions, their positive effects tend to last longer than person-directed interventions and may be a more comprehensive and holistic way to address burnout (Awa et al., 2010).

Self-Efficacy

If a burnout intervention is designed to train leaders individually in order to make organizational impact, the intervention should first raise their levels of self-efficacy in their ability to change the key workplace factors of burnout in their work environment. Hence, one way to evaluate the short-term effectiveness of an intervention and the skills that leaders are taught through an intervention or training program is by measuring their self-efficacy. This is defined as an individual's confidence in themselves to execute or perform a task effectively (Bandura, 1977). Despite the fact that self-efficacy does not to refer to one's actual ability to complete the task, rather, it is their confidence or belief in themselves to complete it (Orpen, 1999), research shows that it can be a strong predictor of future performance (Bandura & Locke, 2003; Stajkovic & Luthans, 1998). Self-efficacy is a beneficial construct to measure when assessing the effectiveness of a training program as it relates to numerous positive training outcomes. Past research supports the key role of self-efficacy in predicting the success of a training program for participants. For instance, Chiabaru & Marinova (2005) found that pre-training motivation, which included self-efficacy, predicted skill transfer in employee training programs. Similarly, Gist and colleagues (1991) found that in their negotiation and interpersonal skills training program, self-efficacy predicted skill maintenance and performance seven weeks after training was completed, even after controlling for baseline performance.

Research has also proposed self-efficacy as a mediator between training efficacy and performance. For example, Orpen (1999) found that self-efficacy mediated the relationship between perceived amount of formal training and supervisor ratings of improved performance in employees. Finally, results from Zaki et al. (2019) suggest that self-efficacy partially mediated the relationship between training performance and work performance. Hence, self-efficacy plays a key role in facilitating behaviour change in an organizational training context (Mathieu & Tannenbaum, 1993). Therefore, measuring the self-efficacy levels of participants of a topic before and after a training program can be an effective way to gauge how successful the training was, and predict future performance surrounding the topics of the training or intervention.

Acceptance and Commitment Therapy

Acceptance and Commitment Therapy (ACT; Hayes et al., 2011) is the foundation of the ImpACT Me burnout intervention. ACT is a type of cognitive behavioural therapy that aims to increase participants' psychological flexibility by focusing on mindfulness, acceptance, commitment to values, and behavioural activation (Watanabe et al., 2023). Moreover, participants are taught to increase acceptance of their thoughts, beliefs, and emotions (Mirsharifa et al., 2019). The ultimate goal of ACT is for an individual to gain a sense of purpose in their life, and to choose values and engage in behaviours that move them towards those values (Wu et al., 2013). The ACT matrix (Polk & Schoendorff, 2014) is a successful behaviour change tool used within ACT that moves past simply telling people what to do and helps with the "how" to do it. It allows participants to visualize their "towards-behaviours", ones that move them towards their values, and reduce their "away-behaviours", ones that move them away from their core values (Francis et al., 2016).

ACT has been successfully used to improve a vast range of behavioural and psychological health concerns (e.g., depression, burnout, chronic pain; Hayes et al., 2011) with long-lasting effects. Specifically, ACT is not only used in a clinical setting, but has also been used to deliver workplace interventions that focus on employee health and wellbeing (Unruh et al., 2022). Meta-analytic findings suggest that ACT can be an effective treatment in a workplace setting to reduce psychological distress, burnout, and stress, while increasing well-being and psychological flexibility among employees (Unruh et al., 2022). Additionally, ACT has been effectively used to increase self-efficacy and health behaviours (e.g., nutrition, physical activity, interpersonal relationships) among employees (Schopp et al., 2015). Therefore, ACT and the skills associated with it should help leaders increase their ability to implement organizational changes, such as those that support the prevention of burnout and increased recovery among their employees. Hence, overall, there is strong evidence that ACT is an effective way to improve psychological well-being in an organizational setting.

ACT and Burnout

Within the ImpACT Me intervention, participants were taught the foundations of ACT, and how to effectively create their own ACT Matrix to guide their behaviours to be more towards and value-driven, as there is evidence that using the matrix repeatedly can help individuals move towards their values (Polk & Schoendorff, 2014). With this, individuals used the ACT Matrix to help with habit building on a daily basis. In addition, the ImpACT Me intervention focused on teaching participants to “charge their batteries”, meaning they learned how to set aside time to engage in self-care activities that are linked to their values, and bring them joy. This provides them with additional time to recover, which can reduce and prevent symptoms of burnout, as explained by the Effort-Recovery Model, below.

Effort-Recovery Model. The Effort-Recovery Model (E-R; Meijman & Mulder, 2013) focuses on how individuals can leverage recovery time to alleviate and prevent symptoms of burnout. The Effort-Recovery Model has three main postulates: people use their resources to engage in work-related activities, the use of these resources results in resource depletion, and finally, this depletion can be recovered when those work-related activities end (Meijman & Mulder, 1998). Recovery in the ER-Model is defined as a process in which individuals return to the pre-stressor level (Meijman & Mulder, 1998). However, if individuals do not have time to recover, negative consequences can arise such as diminished well-being. Often times, individuals are unable to find the time to recover, as they have a high number of demands, and their resources continue to drain. When this happens for a prolonged period of time, chronic stress can occur, leading to burnout (Oerlemans & Bakker, 2014). However, recovery can act as a protective factor against burnout when individuals have the opportunity to restore their resources (Rooman et al., 2021).

Recovery Experiences. Recovery is an important process for general well-being and is classified as an individual's functioning returning to pre-stressor levels (Meijman & Mulder, 1998). This can occur when an individual engages in recovery experiences, which refer to activities such as relaxation, psychological detachment, control over leisure time, and mastery experiences (Sonnentag & Fritz, 2007). Based on the Effort-Recovery Model, it is known that recovery can act as a protective factor against burnout (Rooman et al., 2021), and that they can be an effective technique for managing burnout at the individual level (Demerouti, 2015). Of the different types of recovery experiences, detachment from work (i.e., disengaging mentally from work; Sonnentag & Fritz, 2007), relaxation (i.e., activities that require low effort and do not pose demands to your system; Sonnentag & Natter, 2006), and social activities (i.e., spending time

with others after work; Sonnentag, 2001) seem to be the most influential in reducing and preventing burnout (Demerouti, 2015). Given this, past studies have demonstrated that recovery experiences are influential factors for mitigating and preventing burnout (e.g., Poulsen et al., 2015; Yang et al., 2020), and that recovery experiences can be successfully taught through interventions (Siu et al., 2013).

By teaching participants how to regularly charge their battery through ACT behaviour change principles, their ability to recover can increase. For example, an individual may decide one of their values is to be healthy in order to be a more engaged parent or a more patient leader. So, they know that being physically active is a "towards-behaviour" for them. With this, that individual may make more time for recovery (i.e., physical activity after work), providing them the opportunity to recharge and prevent or alleviate symptoms of burnout (Meijman & Mulder, 1998). Hence, there is a strong theoretical foundation as to why using ACT as a basis for burnout interventions can be effective.

Burnout Interventions Using ACT. Past studies have designed interventions driven in ACT to effectively reduce burnout among employees (Towey-Swift et al., 2023). For example, Puolakanaho and colleagues (2020) designed an 8-week intervention to alleviate burnout symptoms among employees. Through weekly face to face group meetings and daily activities delivered through a website, participants showed reduced symptoms of burnout related ill-being at work and increased psychological flexibility and general well-being compared to the control group. Additionally, these effects were maintained during the one year follow up period. Similarly, in a sample healthcare staff, Prudenzi et al. (2022) tested the effectiveness of a 4-session ACT training program intended to reduce psychological stress. They found that the intervention led to a significant decrease in symptoms of psychological distress, but weaker

effects for a reduction of burnout symptoms, and that these effects were moderated by participants' initial levels of distress. Moreover, at four-weeks post intervention, 46% of participants showed improvements in psychological distress that met criteria for clinically significant change. Finally, in their systematic review, Towey-Swift et al. (2023) found that the majority of studies (n = 9) demonstrated positive, significant effects in reducing burnout and well-being. In addition, they found that the effect sizes of these ACT interventions are comparable or even slightly larger than other comparator interventions (e.g., CBT, mindfulness, relaxation).

Wellness Leadership Program. The previous iteration of the intervention that was tested in this study is the Wellness Leadership Program (WL; Gilin et al., 2023), a burnout intervention grounded in ACT. The 6-week intervention was tested in a group of 49 medical faculty leaders, through a 15-week non-random waitlist-control quasi-experiment. Participants completed weekly group online workshops (1.5 hour sessions) and weekly individual expert coaching (20 minute sessions). The content of the WL was driven in ACT, and covered topics including leader core values, self-care, work stress recovery, empathetic leadership skills, and psychological flexibility. Results of the intervention showed that burnout decreased significantly more for the intervention group than in the waitlist control group, and the intervention group showed a prevention of worsened resting heart rate and empathy. The wait-list control group showed no improvements in burnout, and worse (increased) resting heart rates and decreased empathy. Further, resting heart rates showed a preventative-dose response effect, in that participants who did not actively engage with the course showed an escalation in heart rates, but those who attended all sessions showed a decreasing (improved) resting heart rate. In addition to WL, the intervention has previously been trialled with two other groups of healthcare workers as the

Burnout Recovery Program (BRP). First, the content was delivered by subject-matter expert coaches and facilitators (Gilin et al., 2021). Then, the content was delivered by student coaches and facilitators using a train-the-trainer model (Foote et al., 2022). In both trials, compared to the control groups, the intervention groups showed reduced burnout levels and prevention of worsened resting heart rate. Therefore, there is strong evidence that ACT interventions are an effective way to reduce symptoms of burnout in a workplace setting, and delivering the Wellness Leadership Program through an app provides a shorter, more scalable and accessible version for individuals and organizations to use to prevent and alleviate symptoms of burnout.

App-Based Interventions

As we move towards an increasingly digital world, one growing method of delivering interventions and programs for psychological issues is through technology-based applications (Bakker et al., 2016). Creating self-paced programs for individuals to use on their own personal device increases accessibility with regards to time, finances, and location. For example, an individual who is seeking support for insomnia and cannot afford a psychologist, and who does not have the time to commute to in-person appointments can subscribe to an app that provides self-guided meditations to assist with sleep. Past research shows that these apps can be effective in improving mental health and well-being of participants (Donker et al., 2013). However, one factor that limits the effectiveness of app-based interventions is user engagement within these programs (Torous et al., 2018).

Of the existing app-based interventions that target burnout, few show any promising evidence of reducing signs of burnout (Pospos et al., 2018). Moreover, the majority of these interventions are solely person-directed and focus on psychological treatment such as cognitive behavioural therapy, meditation, mindfulness, breathing, and relaxation (Pospos et al., 2018).

Despite some of these interventions that focus on mindfulness and relaxation techniques demonstrating promising results such as reduced burnout, depression, and anxiety (e.g., Pace et al., 2022; Roy et al., 2020), how long these positive effects will last for participants is unknown. Further, one could argue that these existing app-based interventions are not comprehensive enough, as they do not target any organization-directed aspects of burnout.

Past studies show promising evidence that ACT interventions via an app can be a feasible and effective method of delivery. Ditton and colleagues (2023) created an app-based intervention for medical students which was grounded in ACT and focused on psychological flexibility. The primary goal of this study was to assess the feasibility of an app-based intervention. Content included topics such as present-moment awareness and contact with values, and participants engaged in an introductory module to ACT and individualized skill training. Feedback from participants demonstrated that usability, accessibility, and opportunity for self-reflection was positive. In a similar feasibility study, Garcia-Torres and colleagues (2023) tested usability of app-based ACT intervention to reduce psychological distress in cancer patients, where participants had access to a mobile app that provided them therapy related activities such as mindfulness and exercises to clarify values. They found strong rates of usability (54%) and ease of learning scores. Other studies have shown that mobile app ACT interventions can significantly reduce psychological distress, depression, and anxiety, and increase psychological flexibility (Haegar et al., 2019; Levin et al., 2019). In sum, the results of past studies show promising evidence that ACT is a feasible method for targeting burnout and can be delivered via an app-based approach.

The Present Study

ImpACT Me Intervention Content

The topics of the ImpACT Me intervention were grounded in ACT behaviour change principles. The daily content of the program was designed to take ten minutes or less, making it easy for a busy professional to complete throughout their day. All content on the app was accompanied by videos and transcripts for users to engage with, along with gamified features such as "wins" when they complete an activity and "streaks" which count their engagement with the app multiple days in a row. The first component of the program focused on how leaders can charge their own "battery". This consisted of one mini course, *Charge Your Battery*, which included short sessions of one to five minutes on a wide range of topics (e.g., the science of behaviour change, what gets in the way of recharging, creating a routine). The content taught leaders how engaging in behaviours that bring them joy (e.g., physical activity, social connection, being in nature) can help reduce and prevent burnout. This also involved leaders learning about what the ACT Matrix is, and how they can use it to engage in more toward behaviours that bring them closer to their values. Within the app, leaders were able to track their battery-charging and towards behaviours daily. It also helped them to role-model behaviours for their staff, which can impact the culture of self-care within their own workplaces.

The second component of the program focused on what leaders can do with the six workplace factors that contribute to burnout (unsustainable workload, perceived lack of control, insufficient reward for effort, lack of supportive community, lack of fairness, and mismatched values and skills; Maslach et al., 2012). This consisted of six mini courses: one for each workplace factor of burnout. Leaders were educated on each of these factors and were provided specific behaviours they can engage in to address these problems to reduce or prevent burnout in their employees. Additionally, they were provided with prompt questions to guide them in having discussions with their teams about these topics. Finally, they could access a team habit

builder, which is a team matrix that allows them to orient team discussions in terms of shared purpose and towards moves.

Overall Effectiveness

Burnout. As previously described, the first section the ImpACT Me intervention content focused on how leaders can address their own burnout at the individual level. They learned to identify their personal values and engage in behaviours that bring them closer towards them through ACT behaviour change principles. These habits can help promote recovery time and therefore support the prevention and reduction of burnout. Therefore, the first hypothesis of this study was:

H1a. The ImpACT Me Burnout Intervention will reduce the effects of burnout in leaders in the intervention group compared to the control group.

Self-Efficacy. Overall, there are minimal interventions that target organizational factors related to burnout, or ones that take a combined approach. Although the ImpACT Me App was not delivered on an organization-wide level, it did address system-level issues related to burnout that leaders can potentially influence in their own workplace (e.g., reward and recognition). Furthermore, although organizational factors are important to address, leaders often are not equipped with the skill set to target these burnout factors. As previously discussed, measuring self-efficacy on a topic before and after a training program can be an initial indication of how successful the training was. In this study, leaders were assessed on their levels of self-efficacy in the organizational factors of burnout. Therefore, although large-scale organizational changes related to burnout take time to implement, observing a change in self-efficacy in leaders on the workplace factors of burnout can provide support for short-term changes caused by the intervention. Increasing their confidence and ability to target these factors could result in benefits

to their teams and provide a scalable way to address organizational factors in burnout that lead to potential positive downstream effects for their employees. Therefore, the second hypothesis of this study was:

H1b. The ImpACT Me Burnout Intervention will increase levels of self-efficacy in the organizational factors of burnout in leaders in the intervention group compared to the control group.

Mediators and Moderators

ACT Behaviours

As mentioned, ACT has been shown to be effective in reducing and mitigating symptoms of burnout. Furthermore the ACT Matrix has been found to reduce burnout (Gilin et al., 2023). Through the ACT matrix, participants are taught to identify and engage in behaviours that move them towards their values and reduce the behaviours which move them away from their values (Francis et al., 2016). Because of this, ACT processes have shown to mediate the effectiveness of ACT-based burnout interventions (e.g., Lloyd et al., 2013; Prudenzi et al., 2022; Puolakanaho et al., 2020). Therefore, an "ACT behaviour" can be thought of as a value driven behaviour. In doing this, participants build daily habits that help them gain an increased ability to meet job demands. However, in challenging times when people are experiencing higher levels of emotional exhaustion, they may engage in experiential avoidance (Losa et al., 2010). This means that people are less aware of their feelings and thoughts and may be less inclined to lean into their values and behave in a manner that brings them closer to their values. This can increase the risk of higher levels of burnout in the future. Hence, the intervention will provide participants the skills to engage in ACT behaviours which can lead them to reducing their level of burnout. Therefore, the next hypothesis was as follows:

H2. ACT behaviours will mediate the effect of the intervention on T2 burnout scores.

Recovery Experiences

As previously discussed, recovery is an important process for general well-being and can be an effective technique for managing burnout at the individual level (Demerouti, 2015). Additionally, it has been proposed that recovery experiences can act as a mediator between demand-resource imbalance and well-being (Poulsen et al., 2015). For instance, Yang and colleagues (2020) found that recovery experiences mediated the relationship between burnout and quality of life, where recovery experiences alleviated the negative impacted of burnout on quality of life. However, those that are extremely burned out can be less likely to engage in sufficient recovery experiences (Song et al., 2021; Ugwu et al., 2019). Hence, the intervention will provide participants the skills to engage in recovery experiences that can lead them to reducing their level of burnout. Therefore based on the reviewed literature, the third hypothesis was as follows:

H3. Recovery experiences will mediate the effect of the intervention on T2 burnout scores.

Intervention Dosage

One factor that can influence the effectiveness of a psychological intervention is the "dosage" that a participant receives (Fendel et al., 2019), which can also be described as the extent to which the individual participates in the intervention (Karabinski et al., 2021). For example, in the case of an in-person intervention, this could be measured by how often someone attends the training sessions. In the case of an app-based intervention, dosage can be measured through user engagement (e.g., how frequently the individual engages with the app, or the percentage of material the individual completes in the modules). User engagement is a particular problem for self-guided intervention content like apps, and high interest in an app does not

automatically equate to high use (Torous et al., 2018). Since users engage with the app on their own time, they must perceive any benefits from the app as meaningful and intrinsically motivating (Boardman, 2021). Therefore, user engagement is an important metric to gather when assessing an app-based intervention.

Research suggests that user retention rates on self-guided mental health apps drop rapidly within the first month, with approximately 4% of real-world users who download an app continuing to use it after 15 days, and 3% continuing to use it after 30 days (Baumel et al., 2019). Additionally, approximately 69% of users open the app on day 0, relative to 3.9% on day 1 (Baumel et al., 2019). From a research perspective, participant attrition is a major obstacle faced in app-based intervention studies. In their meta-analytic review, Linardon & Fuller-Tyszkiewicz (2020) found that the mean study attrition rate across randomized controlled trials at short-term follow up (8 weeks) was 24%. However, there are ways to increase user engagement within an app including user-centric design, in-app symptom monitoring, ability to track progress, numerical feedback, ease of use, gamification, in-app personalization, and integration with clinical services (Boardman, 2021; Bodner et al., 2020).

Moreover, the exact amount of intervention dosage required is not clear nor consistent (Wasson et al., 2020), and it remains unknown if there is a minimum amount of dosage required to be effective (Karabinski et al., 2021). However, in general, research shows that the more a participant engages with an intervention to its full extent, and the longer the duration is of the intervention itself, the more effective it is (e.g., Chin et al., 2019; Karabinski et al., 2021). Hence, we know that the effectiveness of an intervention likely differs in some way depending on the dosage the participants receive. In terms of the ImpACT Me app, participants' burnout scores may be different depending on their level of engagement in the app, or amount of "dosage" (i.e.,

what point they are at in the program). Therefore, the final hypothesis of this study was the following:

H4. User engagement with the ImpACT Me app moderates the time effect during participants' active intervention period, in which more engagement with the app-intervention results in a greater reduction in burnout scores from Time 1 to Time 2.

The conceptual models for Hypothesis 2 to Hypothesis 4 are presented in Figure 1 and Figure 2.

Figure 1.

Conceptual Model for Proposed Mediation Hypotheses (Hypotheses 2 and Hypotheses 3).

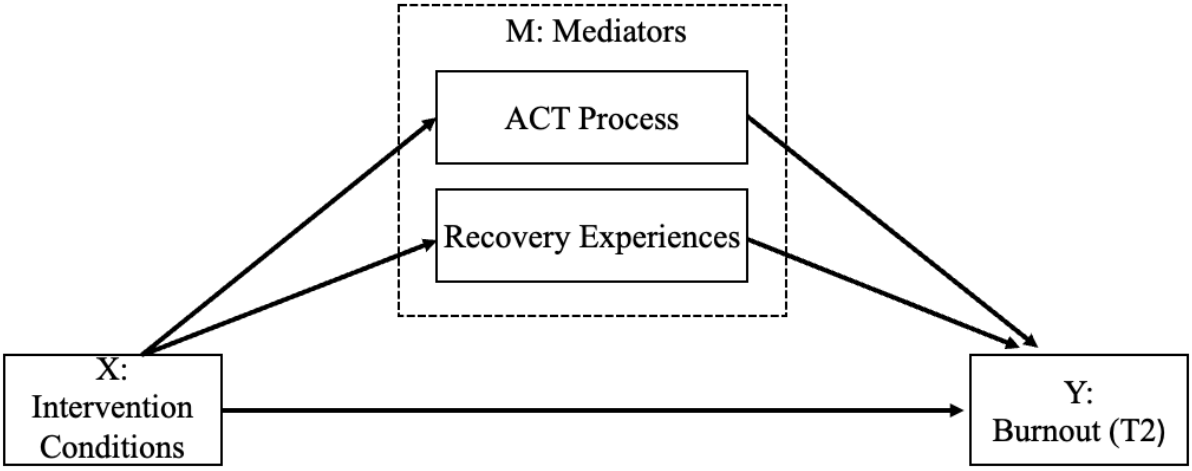
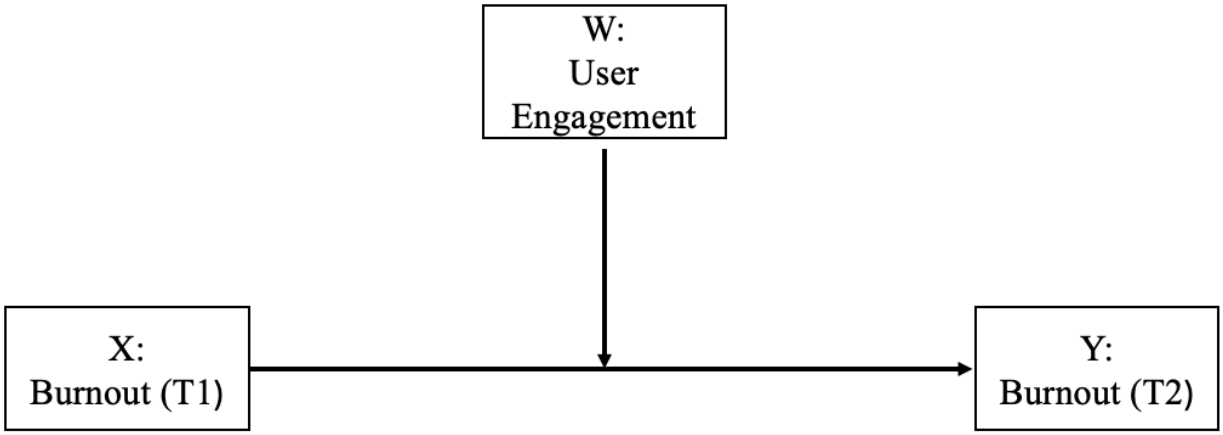


Figure 2.

Conceptual Model for Proposed Moderation Hypothesis (Hypotheses 4).



Methods

Procedure

Participants were recruited through Prolific to complete the study. To be eligible, participants were at least 18 years of age, have access to a smartphone, be able to read and write in English, and be in a position of leadership. For the purpose of this study, a leader was broadly defined as someone with at least three employees directly reporting to them in their organizational structure. Participants received the app for free for the duration of the study which is equivalent to a total of $20 USD (approximately $27 CAD) and were paid £18 GPB (approximately $30 CAD) for their participation directly through Prolific. If a participant chose to withdraw from the study, they still received free access to the app for that time frame. This study used a randomized waitlist-control experimental design (Shadish et al., 2002). One half of the participants were randomly assigned to the intervention group, and one half to the waitlist-control group. In Week 1, all participants were provided informed consent and were asked to complete a baseline online survey including demographic information and relevant outcome and process variables (e.g., burnout, recovery experiences). In Weeks 1-3, the intervention group was asked to use the app at least every second day for five minutes. In Week 4, all participants completed a post-survey including the outcome and process variables. In Weeks 4-6, the waitlist-control group completed the intervention through the app (i.e., used the app at least every second day for five minutes). In Week 6, all participants completed a final post-survey including the outcome and process variables. Participants' app usage was tracked throughout their active intervention period, and they were informed that if they did not meet the app usage requirement (i.e., at least 11 days of app usage), they would not be compensated for their app usage or be

invited back to participate in future time points. This was to ensure participants received "enough" of the intervention.

Participants

Attrition Analysis

A total of 159 participants completed the Time 1 survey in Qualtrics. However, there was a significant amount of attrition between time points. Therefore, in order to examine whether those participants who left the study had commonalities among them, independent samples t-tests were conducted. First, those who left the study after Time 1 (Pre-test only group) and those who had both pre (T1) and post data (T2; Pre-post group) were compared. An independent samples t-test was conducted to compare the *Pre-test only group* and the *Pre-post group* on the following relevant continuous demographic and outcome variables: age, years as a leader, educational level, burnout, ACT processes, self-efficacy, and recovery experiences. Results showed no significant differences between these two groups on any of the variables. Chi-square differences tests were conducted on the nominal variables, gender and ethnicity. Results showed no significant differences between these two groups on either of the variables. Therefore, it can be concluded that the reasoning for participants leaving the study was not likely related to any of the demographic variables or outcome measures discussed above.

A second attrition analysis was done to compare those who had pre-post data but did not use the app sufficiently for inclusion in the analyses (that is, they did not use the app for at least 9 of the 21 days of their intervention period) with those who met the app usage requirements to be invited back after their active intervention period. An independent samples t-test was conducted to compare the *App Attrition Group* and the *App User Group* on the following relevant continuous demographic and outcome variables: age, years as a leader, education level,

burnout, ACT processes, self-efficacy, and recovery experiences. The only significant result was related to years as a leader, $t(275) = -4.01$, $p < .001$, $d = -.55$. Results showed that the *App User Group* consisted of participants who had been a leader longer ($M = 6.61$, $SD = 6.5$) compared to the *App Attrition Group* ($M = 3.5$, $SD = 2.4$). This suggests that those who have been a leader longer may be self-selecting to use the app more frequently than newer, less experienced leaders. Additionally, chi-square differences tests were conducted on the nominal variables, gender and ethnicity. Results showed no significant differences between these two groups on either of the variables.

Final Sample

After attrition, the final sample used for the primary evaluation of intervention efficacy was a total of 89 participants (Intervention $n = 34$, Waitlist-Control $n = 55$). This sample treated participants as members of their assigned group, either intervention or control, and compared their pre and post scores. With respect to gender, 50.6% participants identified as female ($n = 45$) and 49.4% identified as male ($n = 44$). The age of participants ranged from 18 to 66 years old ($M = 33.71$, $SD = 9.89$). The majority of participants identified as Caucasian (61.8%), followed by Asian (28.1%), Black (5.6%), Latin American (2.2%) and Middle Eastern (2.2%). In terms of highest level of education attained, 59.6% reported having a bachelor's degree ($n = 53$), 19.1% had a master's degree ($n = 17$), 7.9% had technical/vocational training ($n = 7$), 6.7% had a high school diploma or equivalent ($n = 6$), 4.5% had an associate's degree ($n = 4$), and 2.2% had a doctorate degree ($n = 2$). Overall, participants had an average of 5.24 years in a leadership position ($SD = 5.14$).

Measures

Self-report surveys were hosted on the *Qualtrics* online platform at Pre-test, Post-test 1, and Post-test 2. Within the app itself, data was collected on user engagement and program completion. Other than user engagement data (dosage), all outcome variables and mediator variables were included in the three surveys hosted on *Qualtrics.* Please refer to Appendix A for a full list of materials used in the study, including items for each scale presented below.

Dosage

Dosage was collected within the ImpACT Me app itself, whereby user engagement was tracked. Various user metrics were tracked in the app, including number of days used, number of times a battery charge or thermometer was logged, app courses completed, and various ACT behaviours (e.g., values, towards and away moves on the ACT Matrix), However, only two metrics from the app were selected as moderators. First, Days Used was selected because it is directly linked to the number of times leaders engaged with the app, and it was the main instruction provided to participants in terms of their app usage requirements. Second, Values Tracked was selected as value-driven behaviour is a core component of ACT. Details of the two variables used to analyze are described below.

Days Used. This is defined as the number of unique days that the participant engaged with the app at least once. Given that the dose-response analysis only included participants who reached sufficient app usage, the value of days used ranged from 9 to 21. Participants who did not use the app for at least nine days were removed from this sample.

Values Tracked. This is defined as the number of value-driven behaviours participants logged into the app. Within ImpACT Me, users were prompted to input behaviours they believe are moving them towards their values (e.g., being physically active). Each time they logged that

they engaged in one of these value-driven behaviours, they would receive a "point" within the app.

ACT Behaviours

ACT behaviours of participants was measured using one subscale of the Comprehensive assessment of Acceptance and Commitment Therapy processes (*CompACT*, Francis et al., 2016). For each item, participants were asked "To what extent do you agree with each statement below in the past month". Specifically, the five items of the behavioural awareness subscale were used (e.g., Even when doing the things that matter to me, I find myself doing them without paying attention). Responses were measured on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). All items were reverse coded such that a high score on behavioural awareness indicates a high level of awareness. The subscale demonstrated strong internal consistency in this sample (α = .82). For the sake of parsimony, the subscale is called ACT-Aware, onward.

Recovery Experiences

Recovery experiences were measured using an abbreviated version of two subscales of the Recovery Experience Questionnaire (REQ; Sonnentag & Fritze, 2007), which measures participants' recovery in the past month. For each item, participants were instructed to "Please tell us about your off-work time in the past month. To what extent do you agree with each statement below". The relaxation subscale (e.g., I did relaxing things) and the psychological detachment subscale (e.g., I do not think about work at all) were used. Each subscale contains three items, and responses were measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A high score on each subscale indicates an individual engages in relaxation and psychological detachment activities more frequently. The REQ demonstrated

acceptable internal consistency in this sample for relaxation (α = .84) and psychological detachment (α = .71). For the sake of parsimony, the subscales are called REQ-Rel and REQ-PsyDet, onward.

Self-Efficacy

Leaders reported their self-efficacy in their knowledge of the six workplace factors of burnout (unsustainable workload, perceived lack of control, insufficient reward for effort, lack of supportive community, lack of fairness, and mismatched values and skills; Maslach et al., 2012). An adapted version of a 12-item self-efficacy scale in clinical training program evaluation (Lorenz et al., 2000) was used, which asks participants to rate their level of confidence that they can perform the tasks related to the program objectives. The adapted scale included five items, and participants were asked "What level of confidence do you currently have in your ability to complete each of the statements below". Examples of sample modified items include "I am confident in my ability to identify the six workplace factors of burnout" and "I am confident in my ability to discuss the six workplace factors of burnout with my team". Responses were measured on a 5-point Likert scale ranging from 1 (not at all confident) to 5 (very confident). The scale demonstrated excellent internal consistency in this sample (α = .95). For the sake of parsimony, the scale is called SE, onward.

Burnout

Burnout was measured using the Maslach Burnout Inventory General Survey (MBI-GS; Maslach et al., 1996). The MBI-GS is a 16-item inventory which consists of three subscales: emotional exhaustion (e.g., "I feel emotionally drained from my work"), cynicism (e.g., "I doubt the significance of my job"), and professional efficacy (e.g., "In my opinion, I am good at my job"). For each item, participants were instructed to "Please read each statement carefully and

decide if you ever feel this way about your job". Responses were measured on a 7-point Likert scale ranging from 0 (never) to 6 (every day). A high score on each subscale indicates a high level of emotional exhaustion, cynicism, and professional efficacy, respectively. The MBI-GS demonstrated acceptable internal consistency across all three subscales in this sample: emotional exhaustion ($\alpha = .95$), cynicism ($\alpha = .87$) and professional efficacy ($\alpha = .70$). For the sake of parsimony, the subscales are called MBI-Exh, MBI-Cyn, and MBI-PE onward.

User Feedback

Participants with sufficient app usage to be invited back for future time points were also asked to provide user feedback ratings. Participants were asked to respond to the following two questions: "I would recommend this app to a friend or colleague" and "I thought the app had a positive impact on my well-being". Responses were measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). They were also asked to respond to the following question "How would you feel if you could no longer use the app?". This was measured on a 5-point Likert scale ranging from 1 (not disappointed) to 5 (very disappointed). For the sake of parsimony, these three questions are called Recommend, Positive, and No longer use onward. Finally, they were asked two open ended questions: 1) Please describe the primary benefit that you have received from the app, 2) How could the app be improved to better meet your needs?

Data Analysis

Prior to any analysis, data screening was performed to check for univariate and multivariate outliers, inaccuracy, or missing values. First, no systematic missing data was found in the dataset. Additionally, no univariate outliers ($z < -3.3$ or $z > 3.3$) or multivariate outliers (Cook's $D < 1$ for all outcome variables) were found. Next, multivariate assumptions of linearity

and normality were examined. Inspections of scatterplots indicated that the variables met the assumption of homoscedasticity and linearity. There were some outcome variables with significant Shapiro-Wilk values (p <.05) in either control or treatment groups, revealing the violation of normality. However, the distribution shape of outcome variables including kurtosis, skewness, histogram and Q-Q plots did not show substantial violation in normality.

Descriptive statistics, intercorrelations, and Cronbach's alpha values for all variables included in the study were examined using SPSS software. In all moderation and mediation analyses (hypotheses 2-4), robust tests were conducted and bootstrap confidence intervals (CIs) were used to test for significant effects, such that if 95% confidence intervals did not include zero, the effect was considered significant (Hayes, 2017).

Evaluation of Intervention Efficacy

To analyze the overall effectiveness of the intervention and potential mediators, all participants were analyzed according to the group to which they were originally, randomly assigned, regardless of the treatment they received. This method of analysis preserves randomization, reduces the risk of bias, and provides "an unbiased estimate of the efficacy of the intervention at the level of adherence in the study" (McCoy, 2017, p.1075). Therefore, although the study spanned six weeks total, target comparisons were analyzed rather than the entire 6-week trajectory.

To test the effectiveness over time of the intervention (Hypothesis 1), the intervention group and the waitlist-control group scores, from week one to week three, were compared. A 2x2 mixed ANOVA, with the within factor as time (pre and post scores on the dependent variables) and the between factor as condition (i.e., intervention, waitlist-control) was conducted. Analyses were run for the three sub-scales of burnout, and for self-efficacy.

To test the mediation models (Hypotheses 2 and 3), the PROCESS Macros for SPSS (Model 4; Hayes, 2017) was used. In all mediation analyses, the "X" variable was Group (intervention vs. control) and the "Y" variables were T2 burnout scores (emotional exhaustion, cynicism, and professional efficacy). The mediators were T2 of ACT behaviours and recovery experiences. Additionally, the T1 of the mediator and burnout scores were used as a covariate to adjust for a baseline group difference in order to have an unbiased difference estimate (Van Breukelen, 2006). Therefore, I was testing whether changes in outcome variables at T2 were mediated by changes in ACT behaviours and recovery experiences caused by the intervention.

Dose Response Analysis

The PROCESS Macro for SPSS (Model 1, Hayes, 2017) was used to test the moderation effect of user engagement on the outcome variables (Hypothesis 4). Composite user engagement scores were tested as a moderator of pre and post scores (T1 versus T2) on burnout scores. Burnout scores of each group (intervention and wait-list control) were taken during their active intervention period only and pooled together. Hence, all active intervention data (intervention and wait-list control group) was pooled together, and no control group data was included in this portion of the analysis. This sample consisted of participants who sufficiently used the app (at least 11 days out of their 21 day active intervention period). The total sample size for this portion of the analysis was 51 participants.

Results

Descriptives and Correlation Analysis

Descriptive statistics, intercorrelations, and Cronbach's alpha values for all study variables at Time 1 and Time 2 are presented in Table 1.

Evaluation of Intervention Efficacy

This analysis compared the intervention group and the waitlist-control group scores, from pre-test (week 1) to post-test 1 (week 3).

Overall Effectiveness

Hypothesis 1a and 1b posit that the ImpACT Me Burnout Intervention would reduce the effects of burnout and increase levels of self-efficacy in the organizational factors of burnout in the intervention group compared to the control group, respectively. A 2x2 mixed ANOVA for each burnout subscale and the self-efficacy scale was conducted to test Hypotheses 1a and 1b. To reduce the chance of Type 1 errors, the Bonferroni Correction (Armstrong, 2014) was used and the error rate was adjusted to $\alpha = .012$. Results are shown in Table 2.

Burnout. Overall, burnout levels among the sample were below average for the professional efficacy scale ($M = 4.85$, $SD = .967$), wherein leaders demonstrated high levels of professional efficacy, hence low levels of burnout on that subscale. However, scores were above average, or above the mid-point of the scale, for emotional exhaustion ($M = 3.77$, $SD = 1.54$) and cynicism ($M = 3.04$, $SD = 1.48$). Additionally, these scores were higher than the mean scores of help-seeking health care leaders in the previous iterations of this intervention. In BRP, mean scores for exhaustion and cynicism were $M = 3.23$ and $M = 2.53$, respectively (Gilin et al., 2021). In WL, scores for exhaustion and cynicism were $M = 3.37$ and $M = 2.68$, respectively (Gilin et al., 2023)

Results of the analysis show the main effects of time (pre-test and post-test) and group (control and intervention) were non-significant for the three burnout subscales (exhaustion, cynicism, and reduced professional efficacy). This indicates that there were no significant changes in burnout scores from T1 to T2, across all participants regardless of group. Moreover, it suggests that there were no significant differences in burnout scores between the control and

intervention groups, averaged across T1 and T2. Additionally, the interaction effect between time and group was non-significant for each of the burnout subscales. This suggests that each study group had similar changes (or lack thereof in this case) in scores on the burnout subscales from pre-test to post-test. Hence, the intervention did not influence any significant changes in burnout scores in the intervention group versus the control group. Therefore, Hypothesis 1a was not supported.

Self-efficacy. Results of the analysis show there was no main effect for time or group. This indicates that there were no significant changes in SE scores from T1 to T2, regardless of group. Additionally, this suggests that there were no significant differences in SE scores between the control and intervention groups, averaged across T1 and T2. However, the interaction effect between time and group was significant, $F(1, 85 = 22.46, p < .001, \eta_p^2 = .21$, large effect). This suggests that the change in SE between pre-test and post-test was different for the control group versus the intervention group.

To follow up on the main results, two independent samples t-tests were conducted comparing self-efficacy for the control group and intervention group at both Time 1 and Time 2: $t(87) = -2.44$, $p < .05$, $d = -.53$, and $t(87) = 1.52$, *ns*, respectively. The results showed that the control group reported significantly higher scores on SE at pre intervention (T1) only ($M = 2.65$, $SD = .996$), compared to the intervention group ($M = 2.11$, $SD = 1.03$). That is, the groups began as non-equivalent on SE despite being randomly assigned to an experimental condition. At post-intervention (T2), the intervention group ($M = 3.04$, $SD = .680$) reported higher scores on SE compared to the control group ($M = 2.75$, $SD = .970$), however they were not significantly different from one another. Next, two paired samples t-tests were conducted to examine whether SE scores from T1 to T2 significant differed for each of the groups, intervention and control.

Results showed no significant difference for the control group $t(54) = .985$, *ns*, but a significant increase for the intervention group: $t(33) = 5.60$, $p < .001$, $d = .97$. Results are presented in Figure 2. Hence, it can be concluded that the intervention group's SE scores increased significantly from pre-test to post-test, and the control group's did not. Therefore, Hypothesis 1b was supported.

Table 1.

Descriptive Statistics, Correlations, and Cronbach's Alpha for Study Variables at Time 1 and Time 2 (N = 89)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Age	-																		
2. Ethnicity	-.14	-																	
3. Gender	.06	-.04	-																
4. Education Level	.16	-.09	.03	-															
5. Years as Leader	**.68**	-.15	.14	.18	-														
6. MBI-Exh T1	-.20	-.13	**-.29**	-.04	-.09	(.95)													
7. MBI-Exh T2	-.20	-.10	**-.21**	-.07	-.09	**.84**	(.88)												
8. MBI-Cyn T1	-.16	.01	-.15	-.05	-.04	**.68**	**.69**	(.87)											
9. MBI-Cyn T2	-.14	-.06	-.12	.09	.03	**.63**	**.74**	**.76**	(.90)										
10. MBI-PE T1	.20	-.10	**.26**	.02	.19	-.21	**-.22**	**-.32**	**-.32**	(.70)									
11. MBI-PE T2	.19	.03	.01	-.12	.14	-.12	-.14	**-.22**	**-.34**	**.65**	(.74)								
12. REQ-PsyDet T1	-.06	.01	.04	-.07	-.12	-.21	-.08	-.03	.01	.09	-.03	(.71)							
13. REQ-PsyDet T2	.05	.04	-.07	-.15	.01	-.05	-.04	-.07	.04	-.15	-.06	**.43**	(.56)						
14. REQ-Rel T1	-.01	-.04	.19	-.10	-.05	**-.36**	**-.28**	**-.24**	**-.24**	**.22**	.06	**.59**	**.23**	(.84)					
15. REQ-Rel T2	-.08	-.04	-.02	**-.24**	-.14	-.14	**-.24**	**-.22**	**-.26**	.14	**.36**	**.31**	**.49**	**.47**	(.83)				
16. ACT-Aware T1	.12	.10	.10	.10	.04	**-.46**	**-.42**	**-.46**	**-.45**	**.25**	.13	.08	-.03	**.30**	.18	(.82)			
17. ACT-Aware T2	.09	-.06	.12	.04	.00	**-.44**	**-.48**	**-.48**	**-.60**	**.34**	**.28**	.13	-.06	**.32**	**.36**	**.54**	(.81)		
18. SE T1	-.02	.03	.18	.08	.01	-.17	-.14	-.07	-.09	.04	.06	.01	**-.22**	.14	-.16	.18	-.02	(.95)	
19. SE T2	.12	.08	.11	.10	.06	-.20	-.20	-.16	-.11	-.03	-.04	-.01	-.07	.13	-.16	**.22**	.08	**.55**	(.93)
M	33.7	-	-	-	5.24	3.77	3.73	3.04	3.20	4.92	4.88	3.24	3.34	3.87	3.98	4.21	4.12	2.45	2.38
SD	9.88	-	-	-	5.42	1.54	1.57	1.48	1.56	.669	.693	.917	.719	.808	.653	1.46	1.42	1.04	.878

Note. Significant correlations are bolded. Gender was coded as 1 = Female, 2 = Male. Age and leadership experience variables were measured in year. Ethnicity was coded as 0 = Caucasian, 1 = Minority. Education level was coded as 1 = Less than a high school diploma, 2 = High school diploma, 3 = Technical/Vocational training, 4 = Associate's degree, 5 = Bachelor's degree, 6 = Master's Degree, 7 = Doctorate. Coefficient alpha is presented in parentheses on the diagonal. All the abbreviations were introduced in the measures section

Table 2.

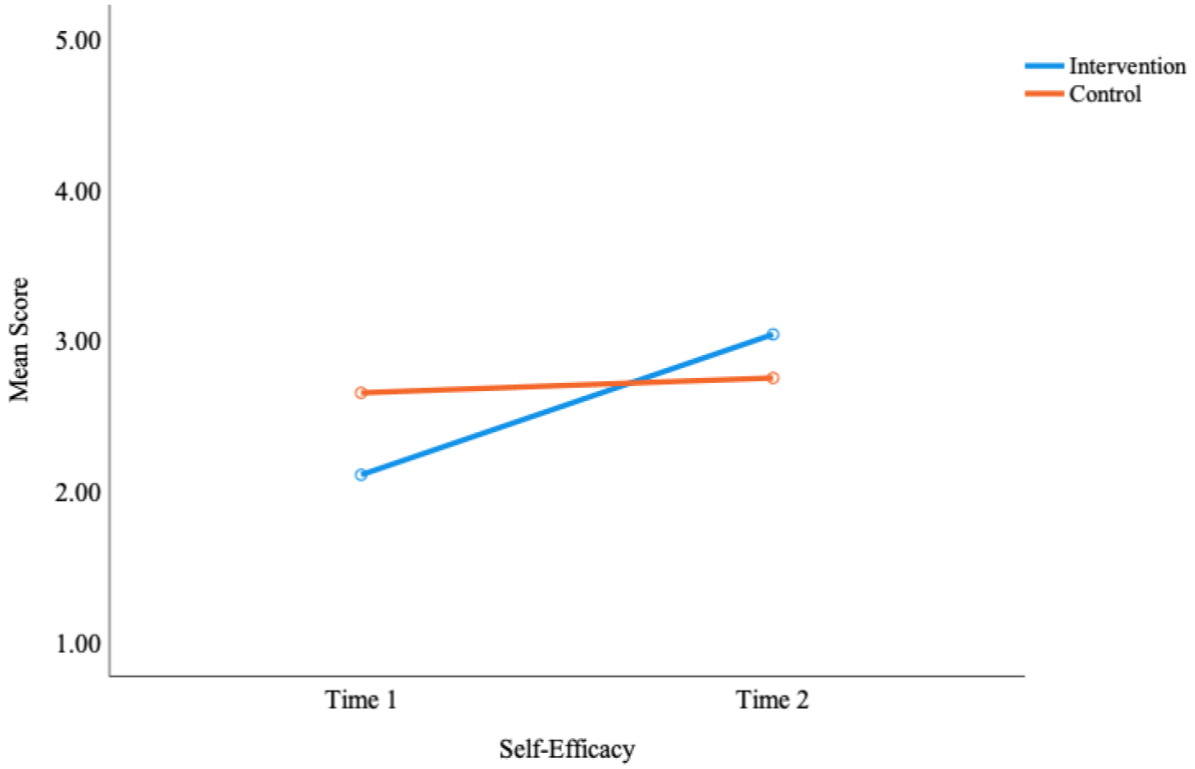
2 x 2 Mixed ANOVA, Within: Time (Pre vs. Post) by Between: Study group (Intervention Group vs. Wait-list Control Group).

Measure		*df*	Mean Squares	F	η_p^2
MBI-Exh	Time	1	.001	.002	.000
	Group	1	1.15	.260	.003
	Time*Group	1	.362	.909	.011
MBI-Cyn	Time	1	.250	.437	.005
	Group	1	2.55	.639	.007
	Time*Group	1	.018	.032	.000
MBI-PE	Time	1	.039	.234	.003
	Group	1	.496	.662	.008
	Time*Group	1	.009	.051	.001
SE	Time	1	.030	.088	.001
	Group	1	.741	.501	.006
	Time*Group	1	7.65	**22.46****	.209

Note. * = $p < .05$, ** = $p < .01$. η_p^2 effect size interpretations: Small effect = .01; Medium effect = .06; Large effect = .14 (Richardson, 2011).

Figure 3.

Self-Efficacy Control Group vs. Intervention Group Pre-test to Post-test



Note. Control Group has no significant change. Intervention Group had a significant increase in self-efficacy.

Mediation

Hypotheses 2 and 3 posit the mediation effect of ACT processes and recovery experiences on the effect of the intervention on (reduced) burnout scores. PROCESS Macro Model 4 for SPSS (Hayes, 2017) was conducted to test Hypotheses 2 and 3. The results from the mediation analyses are presented in Table 3.

ACT Processes. Results demonstrate there is no mediation effect for ACT behavioural awareness (ACT-Aware) on the effect of the intervention on all three burnout subscales (*CI* of indirect effect include zero). In general, the findings indicate that the effect of the intervention on changes in burnout is not mediated through ACT processes. Therefore, Hypothesis 2 was not supported.

Recovery experiences. Results demonstrate there is no mediation effect for recovery experiences (REQ-Rel and REQ-PsyDet) on the effect of the intervention on all three burnout subscales (*CI* of indirect effect include zero). In general, the findings indicate that the effect of the intervention on changes in burnout is not mediated through recovery experiences. Therefore, Hypothesis 3 was not supported.

Table 3.

Mediation Regression Coefficients and Confidence Intervals (CIs) for Predicting Burnout (T2).

Path	X: MBI-Exh (T1) Y: MBI-Exh (T2)		X: MBI-Cyn (T1) Y: MBI-Cyn (T2)		X:MBI-PE (T1) Y:MBI-PE (T2)	
	Coeff.	95% CI	Coeff.	95% CI	Coeff.	95% CI
M: REQ-PsyDet						
X->Y	-.15	[-.54, .22]	-.09	[-.55, .37]	.002	[-.23, .24]
X -> M	-.15	[-.44, .14]	-.16	[-.45, .13]	-.13	[-.41, .16]
COV1 ->M	**.33**	**[.17, .49]**	**.32**	**[.16, .47]**	**.33**	**[.18, .49]**
COV2 -> M	.01	[-.08, .11]	-.03	[-.13, .06]	-.12	[-.40, .01]
M->Y	-.11	[-.39, .17]	.19	[-.15, .53]	.09	[-.09, .27]
COV1->Y	.18	[-.04, .41]	-.01	[- .28, .25]	-.09	[-.23, .04]
COV2 -> Y	**.88**	**[.77, 1.00]**	**.80**	**[.66, .95]**	**.70**	**[.53, 87]**
X->M->Y	.02	[-.05, .11]	-.03	[-.14, .03]	-.01	[-.07, .02]
	N = 89		*N* = 89		*N* = 89	
M: REQ-Rel						
X->Y	-.17	[-.54, .19]	-.15	[-.60, .30]	-.01	[-.22, .20]
X -> M	.04	[-.21, .30]	.02	[-.23, .28]	.04	[-.22, .29]
COV1 ->M	**.39**	**[.22, .56]**	**.36**	**[.20, .52]**	**.37**	**[.21, .53]**
COV2 -> M	.01	[-.07, .10]	-.05	[-.14, .03]	.04	[-.15, .23]
M->Y	**-.39**	**[-.70, -.08]**	-.20	[-58, .18]	**.41**	**[.24, .59]**
COV1->Y	.19	[-.07, .46]	-.05	[- .36, .26]	**-.23**	**[-.37, .09]**
COV2 -> Y	**.87**	**[.75, .99]**	**.77**	**[.62, .92]**	**.68**	**[.52, .83]**
X->M->Y	-.17	[-.53, .19]	-.005	[-.08, .07]	.01	[-.12, .20]
	N = 89		*N* = 89		*N* = 89	
M: ACT-Aware						
X->Y	-.20	[-.57, .17]	-.17	[-.58, .25]	.03	[-.20, .26]
X -> M	-.09	[-.60, .42,]	-.14	[-.64, .37]	-.13	[-.64, .38]
COV1 ->M	**.42**	**[.23, .61]**	**.40**	**[.21, .59]**	**.48**	**[.30, .66]**
COV2 -> M	**-.22**	**[-.41, -.04]**	**-.28**	**[-.47, -.10]**	**.45**	**[.07, .84]**
M->Y	**-.16**	**[-.31, -.02]**	**-.34**	**[-.51, -.16]**	.06	[-.04, .17]
COV1->Y	.02	[-.13, .18]	.01	[- .16, .18]	-.05	[-.14, .04]
COV2 -> Y	**.80**	**[.67, .94]**	**.64**	**[.48, .80]**	**.66**	**[.48, .84]**
X->M->Y	.01	[-.09, .12]	.05	[-.14, .25]	-.01	[-.06, .03]
	N = 89		*N* = 89		*N* = 89	

Note. 95% bias-corrected bootstrapping with 5,000 resamples. Significant results are bolded, X: Independent variable. Y: Dependent variable. M: Mediator. COV1: Mediator assessment (T1). COV2: Burnout assessment (T1). All mediators are assessment (T2).

Dose-Response Analysis

Next, I pooled both study groups from the three weeks of their active course participation (overlaying weeks 1-3 from intervention and weeks 4-6 from waitlist-control). The total sample for this portion of analyses was n = 51. Descriptive statistics, intercorrelations, and Cronbach's alpha values for process and outcome variables at T1 and T2 in the dosage dataset are presented in Table 4. Hypothesis 4 posits the moderation effect of user engagement on the relationship between T1 and T2 burnout (see Figure 2). Specifically, days using the app, and values tracked were tested as moderators. To reiterate, this analysis tests whether greater interaction with the ImpACT Me app (greater "dosage") interrupts or mutes the relationship between burnout before and after using it. This would be an alternative indication of possible intervention efficacy. PROCESS Macro Model 1 for SPSS (Hayes, 2017) was conducted to test Hypothesis 4. The results from the moderation analysis are presented in Table 5. There was no significant moderation of dosage (days used or values) on the three subscales of burnout. Therefore, the amount that participants engaged with the app did not impact their change in burnout from T1 to T2.

Exploratory Moderation Analyses

Given the results from the user engagement analysis were null, I conducted additional exploratory analyses. Since we may expect to see a significant change in the process variables (ACT-Aware, REQ-PsyDet, and REQ-Rel) first before they translate into longer burnout improvements, I checked whether dose moderated the process variables and self-efficacy scores from T1 to T2. Results are presented in Table 6. There was no significant moderation of dosage (days used or values) on the relationships of T1 to T2 of ACT-Aware, REQ-PsyDet, or SE. However, results did show that using the app for more days was associated with lower levels

relaxation recovery at T2 (*b* = .07, *95%CI* [.03, .11], R^2 change = .14), controlling for the other effects in the model. Conditional effects from this interaction suggest that days used was not associated with lower relaxation at T2 at low levels (1 *SD* below the mean). However, relaxation at T1 and T2 had a strong positive relationship at a moderate (*b* = .46, *95%CI* [.27, .65]) and a high (*b* = .67, *95%CI* [.42, .93]) number of days used.

Table 4.

Descriptive Statistics, Correlations, and Cronbach's Alpha for Process and Outcome Variables at Time 1 and Time 2 in dosage dataset (N = 51)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. MBI-Exh T1	(.95)																		
2. MBI-Exh T2	**.75**	(.95)																	
3. MBI-Cyn T1	**.65**	**.76**	(.90)																
4. MBI-Cyn T2	**.55**	**.75**	**.77**	(.92)															
5. MBI-PE T1	**-.29**	**-.36**	**-.34**	**-.34**	(.71)														
6 MBI-PE T2	-.23	**-.35**	**-.40**	**-.50**	**.69**	(.78)													
7. REQ-PsyDet T1	-.21	-.00	.02	.11	.08	-.20	(.81)												
8. REQ-PsyDet T2	-.10	-.11	-.09	-.01	-.14	-.05	**.37**	(.58)											
9. REQ-Rel T1	-.23	-.06	-.05	-.06	.12	-.13	**.73**	**.35**	(.86)										
10. REQ-Rel T2	-.12	-.22	-.16	-.21	**.29**	.23	.23	**.37**	**.46**	(.85)									
11. ACT-Aware T1	**-.40**	**-.38**	**-.38**	**-.28**	.20	.16	.21	.09	.20	.25	(.84)								
12. ACT-Aware T2	-.27	**-.40**	**-.38**	**-.54**	**.36**	**.33**	.08	.01	.14	**.29**	**.55**	(.81)							
13. SE T1	-.10	-.09	.02	.09	.08	.06	.18	-.09	.16	-.03	.03	**-.29**	(.94)						
14. SE T2	-.01	-.14	-.12	-.06	-.02	.14	.68	.05	-.04	.04	.17	-.04	**.32**	(.89)					
15. Days Used	-.13	.02	-.12	-.16	.00	-.04	.20	.11	.08	-.19	.21	.12	-.12	-.01	-				
16. Values	-.10	.02	-.03	.02	-.09	-.20	-.25	-.22	-.15	-.18	-.01	-.00	.01	-.09	**.36**	-			
17. Recommend	.17	.04	.21	.12	.15	.00	-.08	-.04	-.01	.13	.10	.04	.04	.16	.09	.12	-		
18. Positive	-.13	-.03	.03	-.09	.15	.12	-.05	-.12	.06	.20	.06	.18	-.01	.18	.18	.05	**.56**	-	
19. No longer use	-.06	-.16	-.10	-.05	.14	.20	-.12	-.03	-.14	.09	.12	.07	.22	.10	-.06	-.13	.22	**.34**	-
M	3.75	3.66	3.07	3.18	4.90	4.90	3.22	3.41	3.89	4.02	4.14	4.20	2.14	3.16	16.5	5.27	3.90	3.94	2.43
SD	1.44	1.37	1.52	1.51	.643	.663	1.02	.762	.800	.656	1.42	1.38	.931	.705	4.11	7.46	.640	.759	1.03

Note. Significant correlations are bolded. Coefficient alpha is presented in parentheses on the diagonal. All the abbreviations were introduced in the measures section.

Table 5.

Moderation Regression Coefficients and Confidence Intervals (CIs) for Predicting Burnout (T2).

Path	X: MBI-Exh (T1) Y: MBI-Exh (T2)		X: MBI-Cyn (T1) Y: MBI-Cyn (T2)		X:MBI-PE (T1) Y:MBI-PE (T2)	
	Coeff.	95% CI	Coeff.	95% CI	Coeff.	95% CI
W: Days Used						
X	1.33	[-.38, 1.33]	-.01	[-.88, .85]	.97	[-.13, 2.07]
W	-.02	[-.23, .19]	**-.18**	**[-.35, -.003]**	.06	[-.23, .36]
INT	.02	[-.04, .07]	.05	[-.003, .10]	-.01	[-.07, .05]
	R^2 change = .00		R^2 change = .03		R^2 change = .00	
	N = 51		N = 51		N = 51	
	Coeff.	95% CI	Coeff.	95% CI	Coeff.	95% CI
W: Values						
X	**.61**	**[.34, .89]**	**.71**	**[.45, .97]**	**.65**	**[.35, .95]**
W	**-.10**	**[-.20, -.01]**	-.02	[-.12, .06]	-.05	[-.19, .09]
INT	.02	[-.002, .04]	.01	[-.02, .04]	.01	[-.02, .04]
	R^2 change = .03		R^2 change = .01		R^2 change = .00	
	N = 51		N = 51		N = 51	

Note. 95% bias-corrected bootstrapping with 5,000 resamples. Significant results are bolded. X: Independent variable. Y: Dependent variable. W: Moderator. INT: X*W.

Table 6.

Moderation Regression Coefficients and Confidence Intervals (CIs) for Predicting Process Variables (T2) and Self-Efficacy (T2).

Path	X: ACT-Aware (T1) Y: ACT-Aware (T2)		X: REQ-PsyDet (T1) Y: REQ-PsyDet (T2)		X: REQ-Rel (T1) Y: REQ-Rel (T2)		X:SE (T1) Y:SE (T2)	
	Coeff.	95% CI	Coeff.	95% CI	Coeff.	95% CI	Coeff.	95% CI
W: Days Used								
X	-.17	[-1.18, .84]	.39	[-.36, 1.14]	**-.81**	**[-1.57, -.05]**	.56	[-.39, 1.51]
W	-.18	[-.45, .08]	.03	[-.12, .18]	**-.31**	**[-47, -.14]**	.05	[-.09, .18]
INT	.04	[-.02, .10]	-.01	[-.05, .04]	**.07**	**[.03, .11]**	-.02	[-.07, .04]
	R^2 change = .03		R^2 change = .00		**R^2 change = .14**		R^2 change = .01	
	N = 51		N = 51		N = 51		*N = 51*	
	Coeff.	95% CI	Coeff.	95% CI	Coeff.	95% CI	Coeff.	95% CI
W: Values								
X	**.49**	**[.20, .78]**	**.25**	**[.01, .49]**	**.28**	**[.04, .51]**	.25	[-.01, .50]
W	-.04	[-.18, .10]	-.01	[-.08, .05]	-.07	[-.15, .01]	-.01	[-.07, .06]
INT	.01	[-.02, .04]	-.000	[-.02, .02]	.02	[-.01, .04]	-.001	[-.03, .03]
	R^2 change = .-01		R^2 change = .00		R^2 change = .04		R^2 change = .00	
	N = 51		N = 51		N = 51		*N = 51*	

Note. 95% bias-corrected bootstrapping with 5,000 resamples. Significant results are bolded. X: Independent variable. Y: Dependent variable. W: Moderator. INT: X*W.

User Feedback

In addition to the measures discussed above, participants included in the dosage analysis (N = 51) were asked to provide feedback on their experience. Frequencies of each of the three feedback questions are presented below in Table 7. As shown, feedback ratings from users indicate they were relatively satisfied with the app, and that they believed it to have a positive impact on their well-being. This data provides additional information to support the user experience of ImpACT Me. Therefore, despite few statistically significant findings in the sections above, there is still positive support for the app by users who tested it in its initial phase.

Table 7.

User feedback ratings from dose response dataset (N = 51).

Question	**Rating Scale**				
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Recommend	0%	2%	19.6%	64.7%	13.7%
Positive	0%	3.9%	19.6%	54.9%	21.6%
	Rating Scale				
	Not Disappointed	Slightly Disappointed	Neutral	Moderately Disappointed	Very Disappointed
No longer use	25.5%	19.6%	41.2%	13.7%	0%

Note. Recommend = I would recommend this app to a friend or colleague, Positive = I thought the app had a positive impact on my well-being, No longer use = How would you feel if you could no longer use the app.

Discussion

Burnout rates among employees are not decreasing, and the need for effective, theory-based interventions remains high. As leaders hold such a strong influence on workplace culture, targeting a sample of leaders first can be a successful way to alleviate and prevent burnout in both leaders and their subordinates through role-modelling. Moreover, app-based interventions are growing in popularity due to their affordability and accessibility. However, there are limited app-based interventions that target burnout which show evidence of being successful. Therefore, the overarching aim of this study was to test the effectiveness in reducing burnout of an app-based burnout intervention driven in ACT for leaders. Specifically, this study aimed to test a more scalable, app-based delivery of a previous, successful intervention, The Wellness Leadership Program (Gilin et al., 2023).

I hypothesized that the intervention would reduce leaders' burnout scores and increase self-efficacy scores in their knowledge of the workplace factors of burnout. Additionally, I hypothesized that ACT Awareness and Recovery Experiences would mediate the effect of the intervention on the change in burnout scores post-intervention. Finally, I predicted that user engagement with the app would moderate the effectiveness of the intervention, in that more engagement with the app would be associated with higher reductions in burnout scores from Time 1 to Time 2. Overall, I found that the intervention did increase self-efficacy in the intervention group compared to the control group, but burnout scores did not significantly change. Additionally, there was no mediation effect of ACT Awareness of Recovery Experiences. Finally, user engagement did not moderate burnout scores from pre- to post intervention, therefore additional exploratory analyses were conducted. Unexpectedly, days used did moderate the relationship between Time 1 and Time 2 relaxation, in that using the app for

more days was associated with less relaxation at Time 2 (controlling for other effects in the model).

Although the ImpACT Me intervention was completed by participants individually and touched on coping skills for employees to use to prevent and reduce burnout, it did address system-level issues by teaching leaders about the six workplace factors of burnout. Therefore, it was primarily a person-directed intervention, but it did include components of an organization-directed intervention. The majority of burnout interventions in the literature are person-directed, and organization-directed interventions can often be more timely and expensive to implement on such a large scale (Maslach et al., 2001). Therefore, ImpACT Me aimed to test a more feasible way to potentially incorporate system-level problems related to burnout and deliver a combined intervention at a scalable level. However, there were no significant changes in burnout scores among participants in this study.

Overall, there are extremely contradictory findings related to the effectiveness of various types of burnout interventions in the literature. For instance, Awa et al. (2012) reported that 82% of person-directed interventions led to a significant reduction in burnout. In contrast, Marine et al. (2006) found minimal evidence that person-directed interventions were effective in reducing burnout in their sample of healthcare workers. Similarly, organization-directed interventions have been shown to be both effective (Halbesleban et al., 2006) and inconclusive (Awa et al., 2010). Therefore, the results in this study further demonstrate the lack of understanding of the most effective methods in reducing burnout among employees and reiterates the need for additional research.

Overall Efficacy

Burnout

Contrary to my hypothesis and previous literature (e.g., Prudenzi et al., 2022; Puolakanaho et al., 2020; Towey-Swift et al. 2023), the ACT-based intervention did not have a significant effect on reducing burnout in the intervention group compared to the control group. Prudenzi et al. (2022) found ACT training program which included four 2-hour in-person group sessions to be effective in reducing symptoms of psychological distress (e.g., feeling unhappy, depressed, and constantly under strain), and symptoms of burnout (cognitive weariness) in healthcare staff. Similarly, Puolakanaho and colleagues (2020) found that their 8-week intervention, which included eight 2-hour in-person group sessions and daily activities delivered through a website, was effective in reducing symptoms of burnout and increasing psychological flexibility. There are additional ACT interventions that showed to significantly reduce burnout scores in participants (e.g., Emery, 2012; Lloyd et al., 2013; Macìas, et al., 2019), which generally included in-person group workshops, and a minimum of six hours of active intervention time.

One reason for the null findings in this study may be the length of the intervention period. By definition, burnout is a "prolonged period of psychological strain" (Maslach et al., 2001, p.397). Therefore, it takes time to both develop and improve, and the dimensions of burnout tend to be stable in employees with more than one year of tenure (Dunford et al., 2012). In general, burnout interventions range from two days to 10 months (Awa et al., 2010). However, very few burnout interventions have short intervention periods of 20 days or less, and the majority range from one to six months (Walter et al., 2012). In fact, in their meta-analysis, Maricutoiu and colleagues (2016) found that interventions that last less than one month have null effects on exhaustion and professional efficacy, and negative effects on cynicism. In contrast, they found that typically, interventions lasting between one to two months had the largest positive effect on

exhaustion and cynicism. Given that the active intervention period of this study was 21 days, and that participants were only instructed to use the app for five minutes a day, this may not have been enough time to see significant change in burnout scores among participants.

Previous research has found similar, null results for participant burnout scores in an ACT-based intervention (e.g., Clarke et al., 2015; Bethay et al., 2013; Habibian et al., 2018). In their study, Habibian and colleagues (2018) found that their ACT-based intervention in 60 nurses had no significant effect on burnout but did significantly decrease job stress and job stress factors (e.g., role overload and role ambiguity). They discuss how burnout is a process which occurs over a long period of time, therefore short interventions may not be sufficient in changing scores. However, we know that organizational aspects of a job are influential in increasing or decreasing burnout (Maslach et al., 2012). Therefore, if aspects of job stress are capable of changing over shorter periods of time, this may eventually lead to a reduction in burnout.

Similarly, Clarke et al. (2015) found that their brief two-day intervention in staff caring for clients with a personality disorder improved attitudes and measures of staff-patient relations but had no significant effects on burnout and stress at a 6-month follow up. However, participants did show a short-term increase in value-driven behaviours. The authors discuss the potential need for ongoing support to implement the intervention after training given the brevity of the intervention, and that with this additional support, improvements in staff-wellbeing may have been stronger and maintained.

Finally, Bethay and colleagues (2013) reported no significant change in burnout among participants at the three-month follow up after the 3-week combined ACT and Applied Behavioural Analysis (ABA) based intervention. However, in follow-up analyses, they found a significant decrease in in the believability of burnout-related thoughts, a measure of cognitive

defusion, in the ACT group from pretest to follow-up, relative to the group who received ABA only. Therefore, despite significant changes in burnout scores, there was evidence of changes in the psychological flexibility through the use of cognitive defusion techniques (Hayes et al., 2006), which could eventually lead to more significant impacts. Again, emphasizing that it may take a longer period of time to see burnout-related changes, but there are other positive, influential changes observed through brief ACT-based interventions that target burnout.

When comparing the ImpACT Me App to the previous iterations of this intervention, the Wellness Leadership Program (Gilin et al., 2023) and Burnout Intervention Program (Gilin et al., 2021; Foote et al., 2022), both the duration of the active intervention period, and the amount of content participants received differed greatly. In WL, healthcare leaders attended one 90-minute session weekly for six weeks and completed on average three one-on-one 30-minute coaching sessions (this ranged from 0-6 sessions) throughout the intervention as well (a total of 660 minutes). In comparison, the participants in this intervention were required to use the app for a minimum of 55 minutes, for a maximum of 105 minutes. Additionally, in WL, they also had access to subject-matter experts in live settings through both coaching and the general weekly sessions, allowing them to answer questions and receive regular feedback on their progress. Finally, in WL a total of six topics were covered (one topic each week), whereas only two of these six topics were covered in the ImpACT Me Intervention. Despite both WL and BRP being a success, it is also very time consuming and expensive for organizations to participate in. Therefore, the goal of ImpACT Me was to create a more scalable, accessible, and briefer version of the intervention. However, it is possible that the content included in ImpACT Me was not the most influential in terms of reducing burnout. For instance, maybe the coaching component from WL was crucial in making a difference. Therefore, not only was the duration of the intervention

potentially not long enough, but perhaps they did not receive enough content to observe changes in their well-being. Hence, overall, when comparing the ImpACT Me results to WL and BRP, one potential reason for a lack of null findings may be due to the method of delivery of the program itself (i.e., through an app), or the reduced amount of content that participants were exposed to throughout the intervention.

Self-Efficacy

Next, as predicted, the intervention group's self-efficacy on the workplace factors of burnout significantly increased from pre- to post-intervention and the control group's did not. Leaders were asked to specifically rate their confidence in what the six factors are, why they are important, how to apply them in the workplace, and how to discuss the topics with their team. In this study, compared to the control group, the intervention group reported higher levels of self-efficacy related to the six workplace factors of burnout (unsustainable workload, perceived lack of control, insufficient reward for effort, lack of supportive community, lack of fairness, and mismatched values and skills; Maslach et al., 2012). These findings, combined with the lack of changes in burnout scores may be interpreted as creating a false impression, where leaders may believe they know how to address burnout, however they are not actually taking action to do so. However, research on self-efficacy suggests the predictive abilities that self-efficacy can have on future performance (Bandura & Locke, 2003; Stajkovic & Luthans, 1998), skill transfer (Chiabaru & Marinova, 2005), and skill maintenance (Gist et al., 1991). Therefore, as discussed above, burnout may not be something that can be changed over a short period of time. However, an initial increase in self-efficacy in participants is an indication that they did learn and engage with the intervention content, and these learnings could potentially translate into future action.

Within the intervention, leaders learned about what these six factors mean, how they show up in organizations, and how as a leader, they can positively influence these factors for their employees. With this acquired knowledge, it is possible the leaders in this study will move forward in their role as influential contributors to a culture of well-being and self-care. Therefore, this is an important finding as self-efficacy is a key first step in encouraging potential positive downstream effects to employees (Adams et al., 2009). Because of leaders' strong influence on workplace culture and their team's wellbeing (Shanafelt & Noseworthy, 2017), it is crucial for them to understand how burnout can be prevented and alleviated through organizational factors.

Mediation

The mediation models tested were not significant, despite past research demonstrating that recovery experiences and ACT processes mediate the effectiveness of an ACT-based intervention for burnout. For example, Prudenzi et al. (2022) found that the ACT processes of values obstruction, mindfulness, and self-compassion mediated the effect of their ACT intervention on psychological distress and cognitive weariness (a subscale of burnout). This suggests that the ACT intervention worked through participants improving their mindful awareness and valued living. Moreover, Puolakanaho et al. (2020) found that changes in ill-being and well-being were mediated by changes in psychological flexibility skills (mindfulness, frequency of automatic thoughts, believability, and value-based actions). Similarly, Lloyd et al. (2013) found that an increase in psychological flexibility mediated the decrease in emotional exhaustion of participants in their ACT-based intervention. Given the reviewed literature, in the case of the present study, it is possible that behavioural awareness alone is not enough to change symptoms of burnout, and additional parts of ACT that were measured in studies discussed

above (e.g., value-based action, mindfulness) are also core components in seeing significant behaviour change. Therefore, it may be important to measure all components of ACT in future studies.

However, one study that further examined pooled data from the WL (Isfahani; 2022) found that ACT behavioural awareness was the only mediator that demonstrated a significant moderated mediation model, whereby participants in the intervention group could prevent increased burnout over time by engaging in behavioural awareness, compared to the control group. However, this was only a significant finding for the emotional exhaustion subscale of burnout. In contrast, there were null results for openness to experience and valued action ACT processes.

User Engagement

The moderation analysis did not reveal a significant moderation effect of user engagement, for both days used and values tracked, on burnout scores from pre- to post-intervention. Therefore, the amount of "dosage" participants received, or how much they engaged with the app did not influence the level of change in burnout scores. Ideally, a dose-response analysis would be conducted after finding an effect of the intervention through the primary evaluation of intervention efficacy. Despite not finding an effect, I still wanted to test for a potential effect of dose given that this was the first time delivering the intervention through an app. However, given the non-significant changes in burnout scores overall discussed above, it is not surprising that the moderation models were non-significant as well. In a past iteration of this intervention, Gilin and colleagues (2023) found that healthcare leaders who attended more of the courses throughout the intervention showed less heart rate increase over the course of six weeks. However, in line with my findings, there was no significant moderation effect of intervention

dose on burnout. There is no "gold standard" of minimum intervention dosage required to see change reported in the literature (Karabinski et al., 2021; Wasson et al., 2020). However, research generally shows that the more an individual engages with an intervention, and the longer the duration of the intervention, the more effective it is (e.g., Chin et al., 2019; Karabinski et al., 2021). Therefore, similarly to the overall effectiveness discussed above, it is likely that participants did not meet the required amount or duration in order to see significant change, and the "gold standard" of intervention dosage remains unknown.

Given the non-significant findings of my moderation hypothesis, I conducted additional exploratory analyses. Since we may expect to see a significant change in the process variables (ACT-Aware, REQ-PsyDet, and REQ-Rel) first before they translate into longer burnout improvements, I checked whether dose moderated the T1 to T2 relationship among process variables and self-efficacy scores. Results showed that days used moderated the relationship between Time 1 relaxation and Time 2 relaxation. Unexpectedly, using the app for more days was associated with less relaxation recovery at Time 2, as well as less change, or a stronger association, in T1 to T2 relaxation scores. Incorporating an additional task into someone's day, the app in this case, can add to the ongoing "to do list" and therefore take away from designated recovery time.

In similar vein, there can be an initial association between psychological flexibility and distress. In their study, Kroska et al. (2020) found that ACT valued actions was associated with greater peritraumatic stress (emotional and physiological distress during and following a traumatic event) specific to COVID-19 in healthcare workers. They discuss that this finding may reflect the fact that values-based behaviour can often be challenging at first, as value-driven behaviour does not always mean easy, rather it can be difficult to behave in alignment of your

values and initially discover them. It is possible that a similar process is occurring in my study, wherein participants experienced an initial level of exhaustion, or lack of relaxation, when using the app more frequently and engaging with the ACT-based content. Along with an additional task on their "to-do" list, the actual content or work being done in the intervention may not be "relaxing" initially, as it takes work to learn and discover your values and reflect on how you behave according to them.

User Experience

Through user feedback collected in the study, it can be concluded that in general, users were relatively satisfied with their experience using the app. Despite no significant reduction in burnout over the course of three weeks, users rated their experience using ImpACT Me quite highly, with the majority of participants reporting they would recommend the app to a colleague or friend, and that they thought the app had a positive impact on their wellbeing. These ratings provide initial evidence that ImpACT Me is well-received by its users. Moreover, despite participants being instructed to use the app for 11 days in order to receive full compensation for their study participant, the average number of days used of the app was 16. Therefore, participants were willingly engaging with the app more frequently than required of them.

In addition, attrition rates were lower compared to the typical retention rate on self-guided mental health apps. In a research setting, participant attrition is a major barrier in mental health app-based interventions. Studies report attrition rates ranging from 24% (Linardon & Fuller-Tyszkiewicz, 2020) to 47.8% (Torous et al., 2020). Higher retention rates in this study may be because ImpACT Me includes methods that have shown to increase user engagement (e.g., gamification, ability to track progress, Boardman, 2021).

Furthermore, the attrition analysis did not reveal any particular demographic or outcome variables that were related to dropouts in the study. Hence, this demonstrates the app was enjoyed by all types of individuals across various industries with various levels of burnout, rather than catering to one specific type of leader. Overall, the information gathered through user feedback and the reported attrition rates show initial support for the ImpACT Me app by leaders of various demographic backgrounds (age, gender, industry, ethnicity, etc.).

Limitations and Future Research

There are limitations that may have affected the results of this study. First, one of the major limitations of this study is the duration of the intervention and the amount of content included. Given feasibility of the possible time-frame, the active intervention period for each group was only three weeks. Additionally, participants were only required to use the app for 11 days at a minimum. Therefore, the timing and content of the initial WL intervention was significantly cut in order to favour scalability. So, it is possible there would have been more significant findings related to the burnout subscales if participants engaged with the app for a longer period of time. Future research of the ImpACT Me app should consider investigating longer-term impacts of app usage among groups who are motivated to engage with the tool, and potentially incorporating more content that was used in the previous, successful, WL intervention. Additionally, follow ups should be conducted with participants to see whether they are continuing to implement the skills they learn through the intervention, and if any potential effects are long-lasting, or if they dissipate quickly after the intervention is completed.

Second, the nature of the sample may not be ideal for the study. Given that participants were recruited through Prolific, these were not individuals actively seeking support for burnout. Rather, they were eligible through demographic screening criteria to be compensated for this

study. Because of this, their motivation and readiness to engage with the app and apply their learnings in their day-to-day life may not have been strong. Therefore, it may have been more difficult to "move the needle". In contrast, if participants willingly selected into the study because of an interest or desire to reduce their burnout, it may have been easier to see positive changes in their wellbeing over the course of the intervention. Future research may benefit from testing the app with groups that are actively seeking support for burnout. With this, participants may be more engaged in the material, and be more likely to experience significant positive changes in their well-being.

Finally, given that this study was conducted in leaders, it is possible there are other relevant indicators that the app was beneficial that were not captured in this study. For instance, it is possible that the leaders' employees were able to see changes in the way their leaders spoke about burnout and implemented the advice from the courses regarding role-modeling healthy behaviours. Future research should aim to partner with organizations and implement this study with dyads of leaders and subordinates. This would allow for an examination of potential downstream effects of a burnout intervention for leaders and examine how their increase in self-efficacy of knowledge of the organizational factors of burnout affects their subordinates work-life. For instance, studies should capture subordinate ratings on various supportive leader behaviours pre- and post-intervention.

Conclusion

Overall, this study shows initial evidence that the ImpACT Me app can improve leader self-efficacy related to the workplace factors of burnout, which is an important step in recognizing signs of burnout in both themselves and their employees. However, the lack of significant changes in burnout scores reflect the inconsistent findings related to the effectiveness

of various types of burnout interventions in the literature. Despite this, participants reported enjoying the app over the course of 21 days, and the majority believed it had a positive impact on their well-being. Therefore, there is support for the enjoyment of an app-based intervention for burnout, and that there is potential to see changes in well-being of leaders. However, it is possible that the active intervention period did not last long enough and that the content and method of delivery of this intervention through an app is not currently sufficient enough to observe significant changes in burnout within leaders. In sum, the results of this study further demonstrate the complexity of addressing burnout, both individually and organizationally, and suggest that additional research is required to determine the most effective methods to support employees.

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Appendix A

Informed Consent

INFORMED CONSENT FORM:

SMU REB #24-017

Evaluation of ImpACT Me app, Study 2

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FUNDER: Unfunded.

RESEARCH PARTNERS

This research is being conducted by graduate students, Dr. Dayna Lee-Baggley and Impact Workplace Solutions (who is creating the app). Dr. Lee-Baggley and her graduate students are conducting a research study on the app for the purpose of graduate student thesis and in order to publish the results in academic journals.

INTRODUCTION

You are being invited to participate in a study that will evaluate the impact of a new app, ImpACT Me. Your participation is entirely voluntary, so it is up to you to decide whether or not to take part in this study. Before you decide, it is important for you to understand what the research involves. This consent form will tell you about the study, why the research is being done, what will happen to you during the study and the possible benefits and risks. If you wish to participate, you will be asked to provide electronic consent. If you do decide to take part in this study, you are still free to withdraw at any time, without **giving any reasons for your decision.** If you do not wish to participate, you do not have to provide any reason for your decision not to participate.

PURPOSE OF THIS RESEARCH

The purpose of the study is to evaluate the effectiveness of ImpACT Me (website: https://impactme.app/) which is an app that harnesses the power of Acceptance and Commitment Therapy (ACT) to support active skill development to address burnout. ACT is a dynamic approach that focuses on empowering participants experiencing burnout by equipping them with actionable skills. ImpACT me is designed to provide support for these new skills through small daily doses of engaging, interactive content easily accessible through the user's phone. The ImpACT Me app is thus a scalable, evidenced-based app that delivers virtual Acceptance and Commitment Therapy to support employees and leaders in the workforce accessing support and building skills to deal with burnout and maintain engagement in the workforce. Results will be published in a report placed on the project website (https://impactme.app/research). Because our goal is to provide an evidence-based intervention that actually helps people, results will also be used for promotional and commercial purposes. The results will also be disseminated to the public as well as through academic forums (e.g., conferences, academic journals).

WHO IS ELIGIBLE TO TAKE PART?

Participants must be a leader in their workplace (defined as having at least 2 employees who directly report to them in the organizational structure), over the age of 18, and have access to a smart phone. Participants must be able to read and write in English as there are no translations of the research materials at this time.

WHAT DOES PARTICIPATING MEAN?

After electronically signing this Informed Consent Form, you will be asked to complete a pre-study online survey on relevant mental health variables and demographic information (which will take about 20 minutes). You will then be placed in one of two groups. Group 1 will be asked

to use the app at their own discretion for 4 weeks, starting immediately. Group 2 will be asked to use the app at their own discretion for 4 weeks, starting 4 weeks after Group 1. There are various features that you can engage with on a daily basis in the ImpACT Me App. These include logging your daily "battery charge" to track how you are feeling, tracking your daily behaviours that are charging or draining your battery, and learning tools and skills through short 5-minute videos to help you manage and prevent burnout. We will gather data from in-app questionnaires, participation rates, app usage, weekly questionnaires on relevant mental health variables (about 5 minutes), and daily tracking of relevant behaviours. Lastly, you will be asked to complete a second survey (a post-study survey) after the study ends and one month afterward (follow-up survey). These will also take about 20 minutes. You will have access to the app for 2 months after the study is done.

WHAT ARE THE POTENTIAL BENEFITS OF THIS RESEARCH?

You may directly benefit from this study by getting the downloadable ImpACT Me app free of charge that can help you build skills to deal with burnout. There are also potential benefits to society at large. If the ImpACT Me app is effective, it may provide a scalable, accessible resource to address burnout in Canadian workplaces.

WHAT ARE THE POTENTIAL RISKS FOR PARTICIPANTS?

You will be asked questions about yourself and questions about burnout, mood and well-being. There is a slight chance that talking about these topics may make you feel uncomfortable or anxious. You will be able to skip any questions you do not feel comfortable answering and use the app at your discretion. Additionally, you will be provided with additional free mental health resources (e.g., Wellness Together) and suicide support (e.g., Talk Suicide Canada), and be

advised to access your employee assistance programs should you identify the need during the research study.

WHAT WILL BE DONE WITH MY INFORMATION? (OR WHO WILL HAVE ACCESS TO IT?)

Types of Information Collected: We will need to collect your responses from the ImpACT Me app and the surveys. The ImpACT Me app will collect data used for the purpose of the research study including mini-surveys on burnout, mood, well-being, the number of times the app was opened, the completion rate of modules in the app, and the amount of time using the app. In-app data is encrypted so the researchers will not know the content of your responses only the frequency of your responses. For instance, data will be collected on behavioural tracking (i.e., how many times a user reports their daily re charging behaviours), but we will not collect data on the actual behaviours and information you input into the app. Additionally, we will collect the number ratings of your battery charge and thermometer. This data is collected continuously and will be used in data analyses. The surveys will be conducted at the beginning of the study and 4 weeks after you start using the app and will ask questions about your well-being and burnout. They also collect basic demographic information (e.g., age, type of work). Your data will only be accessible by members of the research team and the technician who will help with the ImpACT Me app (if you experience technical difficulties downloading the app). Members of the research team sign confidentiality contracts. Your employer will not have any access to the data and will not know who is participating in the research.

How will data be kept secure? Data from the surveys and the app are stored in two databases, a system designed to keep your data secure. One database links your personal information (e.g., email address) to a research ID. The second database uses only the research ID to link it to your

survey and app data. Therefore, both databases would have to be breeched for your personal information to be revealed. Data collected by the app is stored using the highest levels of security on Canadian servers. Data will also be stored on the secure servers of Saint Mary's University. All data will be de-identified in order to protect your confidentiality and privacy. In-app data is encrypted so the researchers will not know the content of your responses only the frequency of your responses.

Dissemination of research results: Once all the data are collected and analyzed for this study, we plan on sharing the results with the research community through seminars, conferences, presentations, and journal articles.

Dissemination of research results to participants: Results of this study are anticipated to be available by November 2024. You will be able to view the study results on our research webpage (https://impactme.app/research).

WHAT TYPE OF COMPENSATION IS AVAILABLE FOR PARTICIPATION?

Participants will be compensated directly by Prolific with £18 GBP upon completion of the study. In addition, participants will have access to the ImpACT Me app free of charge for the duration of the study which is equivalent to $10 USD.

HOW CAN I WITHDRAW FROM THIS STUDY?

You are free to withdraw from the research study at any time without penalty. If at any point you are interested in withdrawing from the study, please inform the research team of your desire to do so. No additional data will be collected for research. Data that has already been collected up to that point is de-identified and you will not be able to withdraw your data.

POTENTIAL CONFLICT OF INTEREST

Dr. Lee-Baggley is a co-owner of Impact Workplace Solutions (who is creating the app) and receives a small profit from revenues of this app. She will not receive any compensation for the research studies examining the app.

HOW CAN I FIND OUT MORE ABOUT THIS STUDY?

If you are interested in getting more information about this study, please contact the lead researcher Dr. Dayna Lee-Baggley at Dayna.Lee-Baggley@smu.ca. This research study has been reviewed and cleared by Saint Mary's Research Ethics Board. If you have any questions or concerns regarding ethical matters, please contact the Saint Mary's University Ethics Board at ethics@smu.ca or 902-420-5728.

By clicking "I consent to participate" below indicates you agree to the following:

- I have read and understood the subject information and consent form and am consenting to participate in the above-named study
- I have had sufficient time to consider the information provided and to ask for advice if necessary.
- I have had the opportunity to ask questions and have had satisfactory responses to my questions.
- I understand that all of the information collected will be kept confidential and that the result will only be used for scientific objectives.
- I understand that my participation in this study is voluntary and that I am completely free to refuse to participate or to withdraw from this study at any time without changing in any way my employment.

- I understand that I am not waiving any of my legal rights as a result of signing this consent form.
- I have read this form and I freely consent to participate in this study.
- I have been told how I can receive a copy of this form.

If you wish to have a copy of this form for your records, please print it BEFORE clicking on the consent link below.

Appendix B

Full Set of Survey Measures

Demographic Questions

1. What is your age? Please enter whole numbers (e.g., 35).

2. Which of the following best describes your gender identity?
   - Man
   - Woman
   - Genderqueer
   - Intersex
   - Non-binary
   - Transgender man
   - Transgender woman
   - I use a different identifier for my gender
   - I prefer not to answer

3. What is your ethnicity? (Note: you may check all that apply)
   - White
   - Black
   - Hispanic/Latino
   - Asian
   - Middle Eastern
   - Native/Aboriginal/Indigenous
   - Mixed race
   - Other
   - I prefer not to answer

4. What is the highest level of education you have completed?
   - Less than a high school diploma
   - High school degree or equivalent
   - Technical/vocational training
   - Associate degree
   - Bachelor's degree (e.g., BA)
   - Master's degree (e.g., MA, MEd)
   - Doctorate (e.g., PhD, EdD)
   - Other (please specify)
   - I prefer not to answer

5. What is your job industry?

- Trade
- Manufacturing
- Health care and social assistance
- Educational services
- Professional, scientific and technical services
- Construction
- Accommodation and food services
- Finance, insurance, real estate and leasing
- Public administration
- Transportation and warehousing
- Information, culture and recreation
- Other services
- Businesses, building and other support services
- Forestry, fishing, mining, oil and gas
- Agriculture
- Utilities
- Other (please specify)
- I prefer not to answer

6. What is your job title? Please enter your response below.

7. How many years have you been in a leadership role (i.e., had at least three employees who directly report to you)? Please enter whole numbers below (e.g., 2)

Maslach Burnout Inventory General Survey (MBI-GS; Maslach et al., 1996)

NOTE: This scale is proprietary and we have purchased online licenses. It is comprised of 16 items but the publisher only allows one sample item from each subscale to be listed.

Please read each statement carefully and decide if you ever feel this way about your job.

0	*1*	*2*	*3*	*4*	*5*
Never	*Once a month or less*	*A few times a month*	*Once a week*	*A few times a week*	*Every day*

1. I feel emotionally drained from my work.
2. I doubt the significance of my job.
3. In my opinion, I am good at my job

Recovery Experiences (REQ; Sonnentag & Fritze, 2007)

Includes two subscales: Relaxation and Psychological Detachment (abbreviated).

Please tell us about your off-work time in the past month. To what extent do you agree with each statement below:

1	2	3	4	5
Strongly disagree	*Disagree*	*Neither agree nor disagree*	*Agree*	*Strongly Agree*

1. I don't think about work at all
2. I distance myself from my work
3. I get a break from the demands of work
4. I kick back and relax
5. I do relaxing things
6. I use the time to relax

Comprehensive assessment of Acceptance and Commitment Therapy processes (*CompACT*, Francis et al., 2016).

Includes one subscale: Behavioural Awareness.

To what extent do you agree with each statement below in the past month:

1	2	3	4	5	6	7
Strongly disagree	*Disagree*	*Somewhat disagree*	*Neither agree nor disagree*	*Somewhat Agree*	*Agree*	*Strongly Agree*

1. Even when doing the things that matter to me, I find myself doing them without paying attention.
2. I rush through meaningful activities without being really attentive to them.
3. I do jobs or tasks automatically, without being aware of what I'm doing.
4. It seems I am "running on automatic" without much awareness of what I'm doing.
5. I find it difficult to stay focused on what's happening in the present.

Self-Efficacy Scale (Lorenz et al., 2000).

NOTE: This scale was adapted to examine how participants reported their self-efficacy of their knowledge of the six workplace factors of burnout (Maslach et al., 2012).

What level of confidence do you currently have in your ability to complete each of the statements below:

1	2	3	4	5
Not at all confident	*Not very confident*	*Somewhat confident*	*Confident*	*Very confident.*

1. Apply the knowledge of workplace factors of burnout with my team.
2. Explain the rationale underlying the six workplace factors of burnout .
3. Discuss the six workplace factors of burnout with my team.
4. Identify the six workplace factors of burnout.
5. Use burnout strategies to help reduce and prevent burnout among my team.

Appendix C

ImpACT Me instructions provided to participants

You have been selected to be in the first group of participants to use the ImpACT Me App for the next 21 days!

In order to be eligible for compensation while using the app and be invited back for the second portion of this study, you are required to use the app for 5 minutes every second day (your usage will be tracked through the app). We will only be compensating and inviting the participants who meet this level of app usage back for the remaining portions of this research study.

Below, we will provide a link to access the app and set up your account. It will require an email address and password to create the account. Please create your account using your preferred email address.

When creating your account and prompted for payment, please use the promo code PHSLAB2024 to register for the app free of charge. You will be asked to include your credit card information, however this will not be charged with the use of the promo code. If for some reason you are charged, please contact the research team and we will immediately rectify the situation. The researchers will not see any of your credit card information as payment through the app is secure

Please open this link to the app in a new tab on your browser to create your account and return to complete the survey to register your completion with Prolific: https://app.impactme.app/register/

Please enter the email address you created your ImpACT Me account within the text box below: