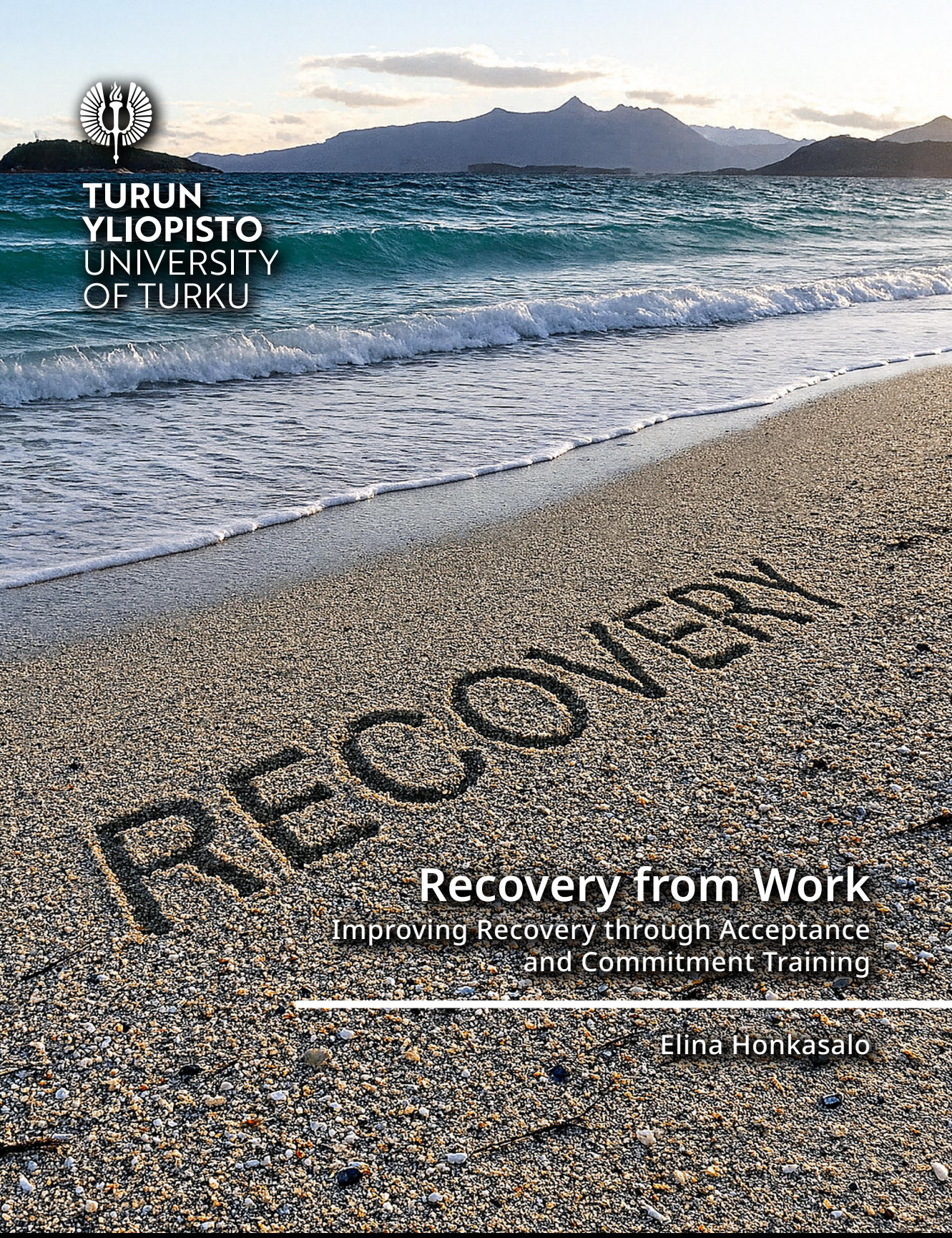

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Recovery from Work

Improving Recovery through Acceptance and Commitment Training

Elina Honkasalo

TURUN YLIOPISTON JULKAISUJA – ANNALES UNIVERSITATIS TURKUENSIS
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ABSTRACT

My thesis aimed to examine effective recovery interventions. I was particularly interested in investigating whether Acceptance and Commitment Training (ACT)-based methods could promote recovery from work. Another important focus of my thesis was to examine how recovery interventions produce their effects, which has so far received less research attention. This thesis also sought to provide better insight into previous worksite ACT and recovery intervention studies. The main theoretical frameworks my thesis utilised were the recovery experiences framework (Sonnentag & Fritz, 2007), the ACT model (S. C. Hayes et al., 1999), and resource-based theories, including the Conservation of Resources Theory (COR) of burnout and work-engagement (Gorgievski & Hobfoll, 2008), and Goal-related Context-sensitivity hypothesis (Bond et al., 2006). My thesis approached psychological flexibility (a core concept of ACT) through these resource theories in particular.

My thesis consists of three essays: a narrative literature review of prior recovery interventions, a systematic literature review of previous worksite ACT studies, and an intervention study with a waitlist control group. The narrative review comprised 15 studies, while the systematic review critically examined 29 articles. In the intervention study, 59 participants from two Finnish public sector organisations were assigned to an immediate ACT group (n = 32) or a waitlist control group (n = 27). The groups received 12 hours of training, and the intervention imparted a mixture of recovery-, mindfulness- and values-based skills. Data were collected at the baseline (T1), at the end of the immediate ACT group's training (T2), and at the end of the waitlist control group's training (T3).

The findings from the narrative review suggest that recovery-specific training interventions and interventions not specifically tailored for recovery (e.g., mindfulness) can deliberately improve recovery. The findings likewise indicate that improved cognition and emotion regulation may be the mechanisms by which these interventions work. In turn, results from the systematic review demonstrate that worksite ACT interventions effectively improve employee mental health and well-being. Similarly, worksite ACT interventions were found to increase positive work-related outcomes (e.g., work productivity and personal accomplishment) and decrease negative outcomes (e.g., stress and burnout). Consistent with the ACT model, the review findings also revealed that ACT processes are likely to explain these intervention effects. Finally, the results of the intervention study show that ACT-based

recovery intervention can increase recovery experiences and psychological flexibility and decrease the need for recovery. The findings further indicate that the observed effects occurred through improvements in recovery experiences, as proposed by the theoretical frameworks applied to the recovery process, while no such mediation effect was detected for psychological flexibility.

Taken together, the findings of my thesis support the view that recovery is a malleable process and suggest that efficient cognition and emotion regulation may play a crucial role in recovery promotion. This thesis also presents the first empirical evidence that integrating recovery intervention with ACT methods can benefit recovery, although recovery promotion seemingly occurs through recovery and not ACT processes. Finally, this thesis presents that ACT is useful for recovery and effectively enhances employee mental health, well-being, and work-related outcomes; thus, it is worth applying more widely in the workplace.

KEYWORDS: Recovery, Acceptance and Commitment Training, ACT, Intervention, Mediation, Stress management

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TIIVISTELMÄ

Väitöskirjani tavoitteena oli tutkia työstä palautumista ja erityisesti palautumista edistäviä interventioita. Tutkimukseni keskiössä olivat hyväksymis- ja omistautumisterapiaan (HOT) (S. C. Hayes et al., 1999) pohjautuvien menetelmien hyödyntäminen työstä palautumisen tukena. Toinen päätutkimuskohteeni oli palautumisinterventioiden vaikutusmekanismit, jotka ovat jääneet vähemmälle huomiolle aikaisemmassa tutkimuskirjallisuudessa. Lisäksi pyrin väitöskirjassani kriittisesti arvioimaan sekä tarjoamaan syvempää ymmärrystä aikaisemmasta palautumis- ja HOT-interventiotutkimuksesta.

Väitöskirjani koostuu kolmesta esseestä: narratiivisesta kirjallisuuskatsauksesta aikaisempiin palautumisinterventioihin, systemaattisesta kirjallisuuskatsauksesta aikaisempiin HOT-pohjaisiin työelämäinterventioihin sekä palautumisinterventiotutkimuksesta viivästetyllä kontrolliryhmällä. Narratiivinen katsaus sisälsi 15 tutkimusartikkelia, kun taas systemaattisessa katsauksessa arvioin kriittisesti 29 tutkimusta. Interventiotutkimukseen puolestaan osallistui 59 henkilöä kahdesta suomalaisesta julkishallinnon organisaatiosta. Osallistujat jaettiin HOT-ryhmään (n=32) ja viivästettyyn kontrolliryhmään (n=27). Molemmat ryhmät osallistuivat 12-tuntiseen HOT-pohjaiseen palautumisvalmennukseen. Tutkimusaineisto kerättiin kyselyillä lähtötasolla (T1), HOT-ryhmän valmennuksen jälkeen (T2) sekä kun viivästetty kontrolliryhmä oli osallistunut valmennukseen (T3).

Narratiivisen katsauksen tulosten perusteella voidaan todeta, että työstä palautuminen on – ainakin jossain määrin – muokattavissa, ja palautumista voidaankin edistää erilaisin valmennusinterventioin. Aikaisemman tutkimuskirjallisuuden perusteella toimivia valmennusmenetelmiä ovat niin pelkkään palautumiseen keskittyvät valmennukset kuin valmennukset, jotka vaikuttavat palautumiseen epäsuorasti muiden taitojen oppimisen kautta (esim. tietoisuustaidot tai stressinhallintakeinot). Katsauksen tulokset antavat viitteitä myös siitä, että kognitiivisten toimintojen ja tunteiden onnistunut säätely selittää palautumisinterventioiden vaikutuksia. Systemaattinen kirjallisuuskatsaus puolestaan osoitti, että HOT-interventioiden hyödyntäminen työn kontekstissa tukee työntekijöiden mielenterveyttä ja hyvinvointia. Lisäksi nämä interventiot näyttäisivät sekä edistävän työhön liittyviä positiivisia vaikutuksia (esim. työn tuottavuutta) että vähentävän negatiivisia (esim. stressi ja burnout) vaikutuksia. Katsauksen perusteella HOT-interventioiden vaikutusmekanismit näyttäi-

sivät olevan linjassa HOT-mallin kanssa myös työelämäkontekstissa. Interventiotutkimukseni tulokset taasen osoittavat, että HOT-pohjaisen palautumisvalmennuksen avulla voidaan edistää palautumiskokemuksia ja psykologista joustavuutta sekä vähentää palautumisen tarvetta työstä. Interventiotutkimuksen tuloksien perusteella näyttäisi myös siltä, että palautumisen tarpeen pienenemistä selittää nimenomaan palautumiskokemusten vahvistuminen, ei psykologisen joustavuuden kasvu. Tämä tulos on linjassa palautumista selittävien teorioiden kanssa.

Yhteenvetona väitöskirjani vahvistaa näkemystä siitä, että työstä palautumista voidaan tietoisesti edistää erilaisilla valmennusohjelmilla. Väitöskirjani löydösten pohjalta näyttäisi myös siltä, että erityisesti tunteiden ja kognitiivisten toimintojen onnistuneella säätelyllä on keskeinen rooli työstä palautumisessa. Väitöskirjassani esitetään myös empiiristä näyttöä sille, että HOT-pohjaisella palautumisvalmennuksella voidaan edistää palautumista. Lisäksi väitöskirjani osoittaa, että palautumiskokemusten vahvistuminen välittää tämän intervention vaikutusta palautumisen tarpeeseen. Väitöskirjani pohjalta voidaan myös todeta, että HOT-pohjaisten menetelmien hyödyntämisestä voisi olla hyötyä laajemminkin työelämässä, sillä näiden menetelmien on osoitettu edistävän niin työntekijöiden mielenterveyttä, hyvinvointia kuin suoriutumista työssä.

ASIASANAT: Työstä palautuminen, hyväksymis- ja omistautumisterapia, HOT, interventio, valmennus, mediaattori, stressinhallinta

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October 2025
Elina Honkasalo

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II Honkasalo, Elina. Acceptance and Commitment Therapy (ACT) for Work: A Systematic Review of Worksite ACT Interventions.

III Honkasalo, Elina & Jokisaari, Markku. Improving Recovery from Work: An Evaluation of a Dual-Pathway Model of Acceptance and Commitment Training-Based Recovery Intervention. To be submitted to *European Journal of Work and Organizational Psychology*

1 Introduction

1.1 Recovery from work in contemporary working life

Working conditions have been improving throughout the 20th and 21st centuries, resulting in working life that is safer (Beller et al., 2024), more flexible (Ray & Pana-Cryan, 2021), increasingly focused on employee well-being (Sonnentag et al., 2023), and more considerate towards life outside work (e.g., allowing for parental and sick leave) (Ray & Pana-Cryan, 2021). Simultaneously, modern working life poses several challenges to individual well-being. Expectations of 24/7 digital availability, blurring boundaries between work and home, increasing demands and decreasing resources, uncertainty, and high intensity illustrate the landscape of contemporary working life. Research suggests that work-related stress is on the rise and the increase is particularly driven by psychological demands (Rigó et al., 2021). Studies show that 65% of employees in the US report work as a significant source of stress (American Psychological Association, 2024), while in the European Union, 46% of employees experience severe time pressure or overload of work (European Agency for Safety and Health at Work, 2022). Globally, 41% of employees report experiencing immense stress the previous day (State of the Global Workplace, 2024).

Chronic work-related stress is associated with several individual health problems, such as decreased quality of life (Alexopoulos et al., 2014) and increased risk for incident coronary heart disease (Kivimäki & Kawachi, 2015), mental health problems (Madsen et al., 2017), and burnout (World Health Organisation, 2019). In addition to individual suffering, the economic burden of work-related stress, borne by employers and society, is considerable. For example, 16.4 million working days are lost yearly due to work-related stress, anxiety, or depression in the UK alone (Health and Safety Executive, 2024). In addition, the total cost of work-related stress has been estimated to range between US 221 million and 187 billion (Hassard et al., 2018). Given that work stress affects not only individuals but also organisations and national economies, it has even been referred to as a modern epidemic (Wainwright & Calnan, 2009). Although not everyone experiences high levels of work stress and

individual characteristics, for example extraversion and work experience might explain whether work is perceived as stressful (Sharma & Devi, 2011); nevertheless, work-related stress and strain pose a serious challenge for the modern workforce.

Increasing job demands (e.g., time pressure and workload) and stress also result into increased need for recovery from work (Sonnentag et al., 2017). Recovery from work refers to a process of unwinding during which the psychophysiological systems, activated by a stressful situation, return back to pre-stress levels (Sonnentag et al., 2017). In more practical terms, recovery can be described as the process of 'charging batteries', where work is followed by a period of rest(oration) (Zijlstra & Sonnentag, 2006). Therefore, the primary objective of recovery is to replenish resources depleted by work-related effort (Meijman & Mulder, 1998) and prepare the individual to meet future demands (Zijlstra & Sonnentag, 2006). By down-regulating and stabilising acute stress and load reactions, optimal recovery can interrupt the accumulation of the negative effects of stress, thus preventing the development of the stress-related health impairment process (Geurts & Sonnentag, 2006).

Recovery from work can be passive or active. Passive recovery refers to seeking relief from work-related duties and taking rest, whereas the active approach to recovery proposes that recovery can occur by actively replenishing and restoring internal resources and engaging in leisure activities that are pleasant, self-chosen, and provide experiences of mastery and competence (de Bloom et al., 2010). Combining the passive and active perspectives on recovery, Sonnentag and Fritz (2007) suggest four recovery experiences – i.e., psychological mechanisms – leading to recovery: psychological detachment from work, relaxation, mastery, and control during leisure. Having these recovering experiences during the time outside work are proposed to produce recovery.

Successful recovery has been associated with several favourable effects. Recent meta-analytic evidence (Bennett et al., 2018; Steed et al., 2021) shows that recovery (when conceptualised as recovery experiences) has 1) a positive relationship with vigour and 2) a negative relationship with fatigue while also relating to 3) overall well-being (including psychological and psychosomatic outcomes), 4) sleep, 5) positive and negative affect (respectively), 6) life-satisfaction), and 7) job performance. Recovery experiences also relate to feeling recovered, which is positively related to 1) psychological (e.g., positive affect and mental well-being), 2) psychosomatic well-being (e.g., sleep, general health), and 3) job- and extra-role performance (Steed et al., 2021).

Given the beneficial effects of recovery on employee well-being and performance, as well as a growing body of research indicating that training can improve recovery (Verbeek et al., 2019), methods to promote recovery seem worth exploring further. Prior research suggests that recovery interventions can be person- or work-

focused (e.g., work–break schedules, task variation) (Verbeek et al., 2019). Of person-focused recovery interventions, trainings based on, for example, recovery training (Hahn et al., 2011), stress management (Ebert et al., 2016), or mindfulness (Querstret et al., 2017) have proven effective. However, the potential of Acceptance and Commitment Therapy (ACT) -based methods for recovery remains unexplored. The following briefly introduces ACT and discusses why its processes might be relevant for recovery.

1.2 Acceptance and Commitment Training (ACT) at work

Acceptance and Commitment Therapy (ACT) is a contextual cognitive behavioural therapy method with a long research tradition in clinical psychology. In addition to clinical use (A-Tjak et al., 2015), ACT has proven useful for the working population, particularly for employee (di)stress and well-being (Unruh et al., 2022). In the worksite context, ACT is often referred to as Acceptance and Commitment *Training* (Bond & Hayes, 2002). ACT seeks to improve (employee) health, well-being, and functioning by increasing psychological flexibility (Bond et al., 2016). Psychological flexibility can be improved by promoting mindfulness and acceptance processes as well as commitment and behaviour change processes (S. C. Hayes et al., 2006).

More specifically, psychological flexibility consists of six skills: 1) acceptance of inner experiences such as thoughts, emotions, memories, or bodily sensations as they arise; 2) cognitive defusion, which refers to creating psychological distance to (unwanted) mind content such as thoughts; 3) being present (i.e., nonjudgemental contact with the present moment); 4) self-as-context described as a perspective from which inner experiences can be observed without attachment; 5) identifying values; and 6) engaging with values-directed committed action (S. C. Hayes et al., 2006). Psychological flexibility is defined (S. C. Hayes et al., 2006) and shown (Ren et al., 2019) to be the mechanism through which ACT operates – as well as in the worksite settings (Lloyd et al., 2013).

A recently introduced resource-based view on psychological flexibility further conceptualises psychological flexibility – in the context of work – as a trainable personal resource, which can provide individuals with a wider cognitive-behavioural repertoire, enabling responding to opportunities more effectively and protecting against work strain and energetic resource loss (Flaxman et al., 2023). The resource-based view integrates the aforementioned ACT model of psychological flexibility with the Conservation of Resources Theory (COR) of burnout and work engagement (Gorgievski & Hobfoll, 2008), the Job Demands–Resources Theory (Bakker & Demerouti, 2017), and Goal-related Context-sensitivity hypothesis (Bond et al., 2006). Thus, the resource-based view enables consideration not only of employees'

responses to their inner experiences but also of external contexts (e.g., psychosocial characteristics of the working environment) and the interplay between them (Flaxman et al., 2023). While the ACT model of psychological flexibility is also likely to explain ACT's effects on general mental health at work, the resource-based view on psychological flexibility is argued to offer a better explanation of ACT's broader impact on employee psychological health and behavioural effectiveness (Flaxman et al., 2023).

In more practical terms, ACT has been argued to be suitable for worksite health programmes for several reasons, including a brief and skills-based approach, a transdiagnostic perspective (emphasising shared mechanisms across psychological difficulties and disorders), effective delivery in groups and self-help formats, and effects that reach beyond (mental) health improvements (Flaxman et al., 2023).

In areas relevant to recovery, prior worksite ACT interventions have demonstrated favourable effects on employee stress (Unruh et al., 2022), especially for those with high baseline stress (Brinkborg et al., 2011). Worksite ACT interventions have similarly been found to increase work engagement (Reeve et al., 2021), productivity (Gaupp et al., 2020), and professional self-efficacy (Biglan et al., 2013). Prior ACT interventions have also been shown to be effective in improving potential antecedents of poor recovery, such as worrying (Krafft et al., 2022) and rumination (Dereix-Calonge et al., 2019), while alleviating the likely consequences of poor recovery, including exhaustion (Hofer et al., 2018) and burnout (Puolakanaho et al., 2020); however, conflicting results on burnout have also been observed (Reeve et al., 2018). Furthermore, psychological flexibility has been found to attenuate the harmful effects of workload and demands (Kopperud et al., 2021; Onwezen et al., 2014).

Lastly, as psychological flexibility builds on acceptance (Stockton et al., 2019), studying ACT would allow for investigating the role of acceptance-based regulation strategies in recovery. Previous research proposes that recovery will more likely occur through mood regulation strategies focused on diverting attention away from stress, rather than those based on stress acceptance (Sonnentag & Fritz, 2007). In contrast, ACT posits that accepting stress rather than avoiding it reduces its impact and produces increased wellbeing (S. C. Hayes et al., 2006). Against this background, ACT seems to open promising avenues for investigating its effect on recovery.

1.3 Gaps in the current knowledge

Three gaps in current knowledge have been identified and are addressed in this thesis. To begin, given the critical role of recovery in employee stress and well-being, recovery research has received increasing interest. Researchers have, for example,

been interested in studying what predicts recovery (Bennett et al., 2018); how (Sonnentag, 2001; Sonnentag & Fritz, 2007), where (Korpela & Kinnunen, 2010), and when (Van Veldhoven & Sluiter, 2009) recovery occurs; and what follows from effective recovery (Binnewies et al., 2009). A growing number of studies have also investigated if training interventions can improve recovery. Prior research has identified several successful training methods, such as stress management techniques (Ebert et al., 2016), recovery training (Hahn et al., 2011), and spending time in nature (Hilbert et al., 2025).

However, the scarcity of critical examinations of the existing evidence limits our understanding of insights derived from single studies (Baumeister & Leary, 1997) and prevents reaching conclusions on the effects of intervention and effective training methods. Without synthesising the existing evidence on recovery interventions, it is for example, impossible to conclude, whether mindfulness is beneficial (Michel et al., 2014) or not (Hülsheger et al., 2015) for recovery (when measured by detachment from work). It seems that only one review has examined the range and nature of evidence of recovery interventions, but unfortunately it did not pay attention to mediating or moderating mechanisms related to recovery training and its effects (Verbeek et al., 2019). However, understanding mediators would be crucial for explaining how and why interventions work, while understanding moderators would help identify to whom and under what circumstances the interventions are most effective (Breitborde et al., 2010). At present, insufficient understanding of mediating and moderating mechanisms underlying recovery interventions limits our ability to draw informed conclusions about change mechanisms and target populations. A lack of understanding in these areas weakens practical implementation and the theoretical advancement of recovery interventions. This is the first research gap identified and addressed in this thesis.

Second, the understanding of worksite ACT interventions remains limited, particularly regarding effects reaching beyond mental health and burnout. While Unruh et al.'s (2022) meta-analysis showed that worksite ACT interventions are effective for improving general mental health and psychological flexibility, they did not, set aside some burnout scales, consider work-specific outcomes. Earlier worksite ACT reviews have likewise mainly focused on burnout (e.g., Prudenzi et al., 2021; Towey-Swift et al., 2023). However, examining also other work-related outcomes would be critical since the ACT model posits that its effects are not limited to mental health improvement (S. C. Hayes et al., 2006) but extend to various life domains (Biglan et al., 2008), including work (Bond et al., 2006). Investigating the work-specific outcomes would thus provide evidence for the ACT's proposed beneficial effect also on non-therapeutic outcomes such as preventative (Biglan et al., 2008) and organisational outcomes (Bond et al., 2006).

Moreover, the existing ACT literature lacks a thorough review of the mediating and moderating variables associated with worksite ACT interventions. However, examining mediation studies would be important as it allows testing whether the underlying theoretical model of ACT plays a role in improving the intended intervention outcomes (Stockton et al., 2019) – also in the context of work. Examining moderation effects would be equally important as they might impact the direction or strength of the relationship between ACT intervention and its outcomes (Stockton et al., 2019). A lack of synthesised evidence exists on the characteristics of worksite ACT interventions, including study designs, methodologies, and the outcome and process measures used. However, identifying these would be essential for ensuring methodological rigour and fostering the impact and relevance of future worksite ACT studies. This is the second research gap identified and addressed in this thesis.

Third, though ACT has been examined within the work context, it has not, to the best of my knowledge, previously been studied in relation to recovery. Prior recovery intervention research has demonstrated the beneficial effect of mindfulness (Querstret et al., 2017) and cognitive-behavioural strategies (Reis et al., 2024) on recovery, but ignored the potential of ACT, which is a third-generation cognitive behavioural therapy approach, that in addition to mindfulness and acceptance processes employs commitment and behaviour change processes (S. C. Hayes et al., 2006). Furthermore, evidence shows that ACT can effectively treat stress-related conditions (Eklund et al., 2023) also at the workplace (Unruh et al., 2022). However, whether ACT could also prevent such conditions from developing (e.g., through fostering recovery) remains unknown. Similarly, the role of acceptance-based mood regulation strategies (e.g., psychological flexibility) is poorly understood in current recovery research. Theoretically, recovery is suggested more likely to occur through strategies that aim to distract attention from stress than via strategies that rely on stress acceptance (Sonnentag & Fritz, 2007), but this has not been empirically tested. Previous recovery intervention research indicates that effective emotion and cognition regulation will likely to play a role in recovery promotion. For example, decreased perseverative cognitions (Ebert et al., 2015) and increased emotion regulation (Ebert et al., 2016) have been found to explain the effects of recovery intervention. However, whether this applies to acceptance-based regulation strategies (e.g., psychological flexibility) remains unclear.

Finally, prior recovery interventions have successively aimed but failed to improve the need for recovery (Verbeek et al., 2019). As the need for recovery is theoretically the most likely outcome of poor recovery (U. Kinnunen et al., 2019) that captures the first signs of work stress and fatigue (Jansen et al., 2002) and which might develop into more severe stress conditions (e.g., burnout) (van Veldhoven & Broersen, 2003), such warrants further examination (Sonnentag et al., 2022). This is the third research gap identified and addressed in this this thesis.

1.4 Research questions

In this thesis, I seek to address the aforementioned three gaps in the ACT and recovery literature via three essays.

In the first Essay, I ask: *What are the consequences of recovery interventions identified in prior research?* I approach the main research question through sub-research questions that explore i) the main, ii) mediating, and iii) moderating effects observed in previous recovery intervention studies and the iv) methodological quality of these studies. Essay 1 thus focuses on investigating what is known and unknown about recovery interventions and their underlying mediating and moderating mechanisms. To reach this aim, Essay 1 employs a narrative review method. By reviewing current recovery interventions, Essay 1 responds to the calls for increasing the understanding of recovery interventions (Sonnentag et al., 2022). Essay 1 also synthesises intervention effects and evaluates their evidence base, thus reaching beyond conclusions that could be drawn from individual studies (Baumeister & Leary, 1997). Through studying the mediating and moderating mechanisms, Essay 1 contributes towards a better understanding of how recovery interventions exert their effect and to whom and under what conditions they are effective. Therefore, Essay 1 not only advances theoretical understanding by linking outcomes with the underlying psychological mechanisms but provides valuable information for recovery intervention development. By identifying gaps in the current knowledge, Essay 1 also suggests evidence-based avenues for future research.

In the second Essay, I ask: *What does existing research reveal about worksite ACT interventions and their impact?* The main research question is addressed via a sub-research question that investigates i) the main effects (with a special focus on work-related outcomes), ii) methodological quality, iii) mediating and iv) moderating mechanisms, and v) special characteristics of prior worksite ACT interventions. Essay 2 thus aims to critically examine previous worksite ACT research and employs a systematic review method to achieve this aim. Essay 2 contributes to our understanding of worksite ACT interventions, their main effects, methodological quality, and the mediating and moderating mechanisms. In particular, Essay 2 focuses on work-related outcomes, thus moving beyond examining the general mental health effects of worksite ACT observed previously (Unruh et al., 2022). By identifying the underlying mediating and moderating mechanisms, this study provides evidence on how, why, and under which circumstances worksite ACT interventions achieve the changes in outcomes. Therefore, Essay 2 enhances the theoretical understanding of applying the ACT model within the work context. Shedding light on psychological mechanisms underlying the intervention effects contributes to the improvement of future worksite ACT interventions. Lastly, Essay 2 provides insights into special characteristics and outcome and process measures used in worksite ACT intervention studies. In doing so, Essay 2 addresses the lack of prior research in these areas.

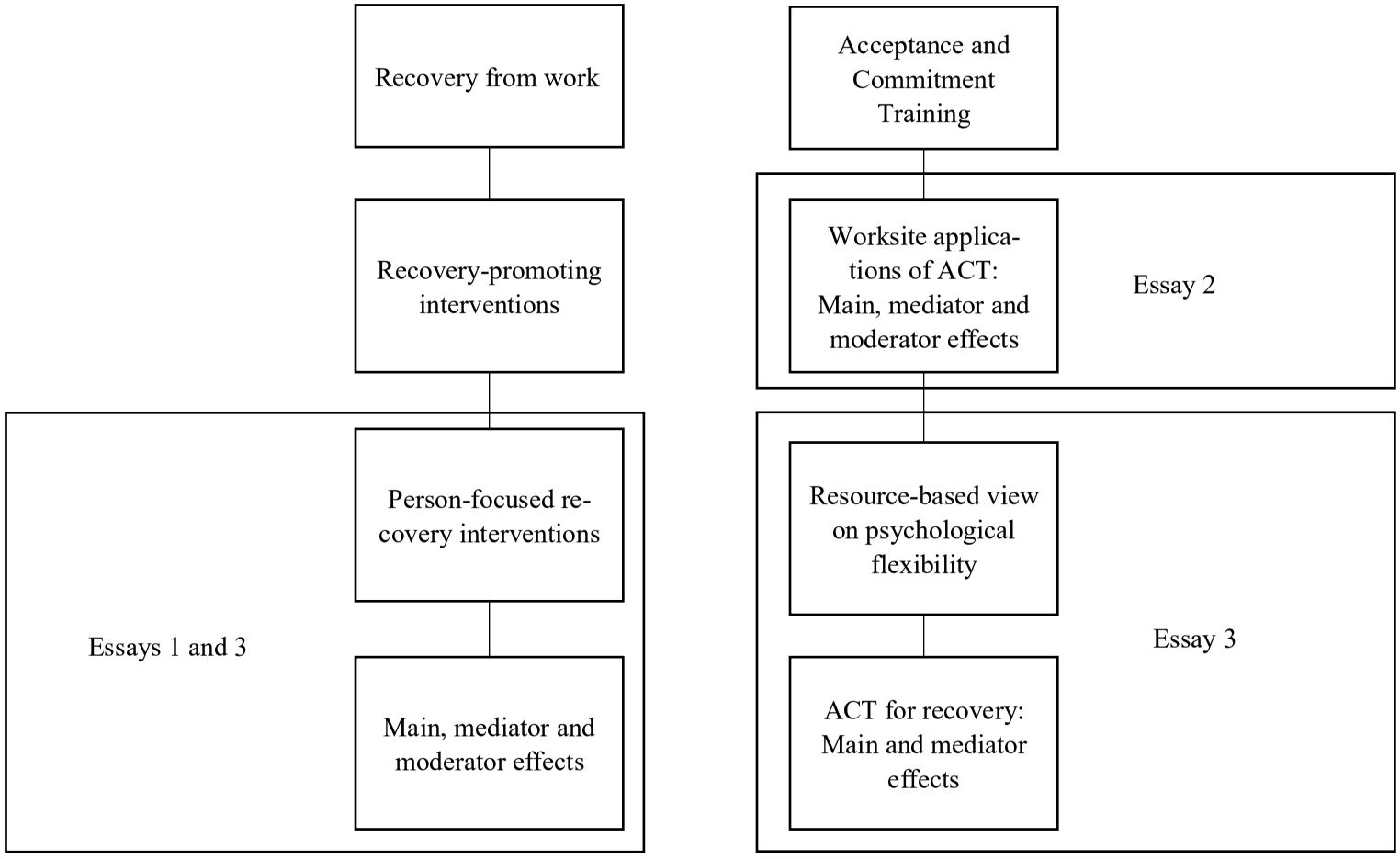
In the third Essay, I draw on the findings of Essay 1 and 2 and ask: *Can recovery be promoted by ACT-based recovery intervention, and is the change mediated via diversionary or acceptance-oriented regulation strategies?* Therefore, Essay 3 first seeks to investigate whether integrating recovery training with ACT-based methods can promote recovery. Second, Essay 3 aims to examine whether strategies based on stress-diversion (i.e., recovery experiences) or stress-acceptance (i.e., psychological flexibility) can explain the change in recovery outcomes. Essay 3 employs an intervention design with a waitlist control group to pursue these aims. Essay 3 provides empirical evidence of ACT-based recovery intervention and studies the causal relation between the intervention and employee recovery. To the best of my knowledge, as this is the first attempt to do so, Essay 3 extends previous research conducted on ACT and recovery. First, Essay 3 expands upon previous recovery research to include ACT and particularly sheds light on the role of acceptance-based regulation processes in recovery. Second, Essay 3 moves beyond prior attempts that have predominantly examined ACT as a treatment for work-related stress conditions and ignored ACT's potential as a preventative approach to the development of such conditions. Moreover, by examining the mediating mechanisms, Essay 3 contributes to a better understanding of the pathways via which recovery interventions may exert their effects. Essay 3 similarly advances theoretical understanding by investigating the role of diversionary and acceptance-based regulation strategies in recovery. Finally, Essay 3 bridges theory and practice, contributing to evidence-based practices.

To conclude, Table 1 summarises the main and sub-research questions of this thesis, whereas Figure 1 presents the positioning of this thesis within ACT and recovery literature.

Table 1
Research Questions and the Essays Addressing Them

	Research Questions
Essay 1 (a narrative review)	What are the consequences of recovery interventions identified in prior research? What i) Main ii) Mediating iii) Moderating effects have been observed, and iv) what is the methodological quality of these interventions?
Essay 2 (a systematic review)	What does existing research reveal about worksite ACT interventions and their impact? What are the i) Main effects (special focus on work-related outcomes) ii) Methodological quality iii) Mediating iv) Moderating mechanisms v) Special characteristics of prior worksite ACT interventions?
Essay 3 (an intervention with a waitlist control group design)	Can ACT-based recovery intervention promote recovery, and is the change mediated via diversionary or acceptance-oriented regulation processes?

Figure 1 *Positioning This Thesis Within Recovery and ACT Literature*



1.5 Structure of the thesis

In this introductory Chapter, I have provided an overview of the current state of the research in recovery and ACT research. Furthermore, I have presented gaps in the existing knowledge and discussed how this thesis aims to address them. To this end, I have also outlined the main and sub-research questions for each essay. Finally, I have specified the contributions of this study. The remainder of this thesis is organised as follows.

In Chapter 2, I delve deeper into the theoretical backgrounds of recovery and ACT. In the first part of Chapter 2, I introduce recovery as a process and as an outcome. In this section, I also provide an overview of recovery interventions. In the second part of Chapter 2, I focus on the theoretical foundations of ACT. I start by introducing the ACT model and the concept of psychological flexibility. I then discuss ACT in the context of work, especially in light of resource-based theories. Lastly, I present a summary of worksite ACT interventions.

In Chapter 3, I present the methods employed in this thesis. I describe the methods (i.e., narrative review, systematic review and intervention design) in detail and offer a rationale for their use. In Chapter 4, I turn to the findings of this research and provide an overview of the results from the three essays included in this thesis.

In Chapter 5, I begin by presenting the contributions of this thesis and discuss their theoretical and practical implications. I also address the limitations for this work in this section. Finally, I conclude by outlining directions for future research and presenting closing remarks.

2 Theoretical Perspectives

This chapter outlines the theoretical background of my thesis. First, I focus on the theoretical foundations of recovery from work. Second, I turn to the theoretical background of ACT. Throughout the chapter, I also discuss the theoretical choices guiding this thesis.

2.1 Recovery from work

Recovery is a psychophysiological phenomenon that has been conceptualised to consist of several distinct facets, including recovery as a process, recovery as an outcome, and recovery settings. Recovery as a process focuses on how recovery occurs, whereas recovery as an outcome concentrates on whether recovery is successful (Sonnentag & Geurts, 2009). In turn, recovery settings refer to temporal and environmental settings where recovery occurs (Sonnentag et al., 2017). In this thesis and what follows, I concentrate on psychological recovery by first addressing recovery as a process. The process approach incorporates specific activities during which recovery occurs and the underlying psychological experiences that facilitate the change in recovery-related outcomes (Sonnentag et al., 2022). Second, I turn to recovery as an outcome of the recovery process and emphasise the state reached post-recovery. Lastly, I focus on recovery-promoting interventions. Detailed discussions on recovery settings and the physiological side of recovery are left outside this thesis.

2.1.1 Recovery as a process

2.1.1.1 Passive and active perspectives

Recovery from work is defined as an unwinding and restoration process during which one's psychophysiological systems, activated by a demanding or stressful situation, return to pre-stress levels (Sonnentag et al., 2017). According to the Allostatic Load Theory (McEwen, 1998), the body responds to daily challenges and stressful situations by activating physiological responses (e.g., increasing sympathetic activity, blood pressure, and heart rate). This stress adaptation process is called

allostasis. Although an essential survival mechanism in the short-term, chronic activation of allostatic response (also referred as allostatic [over]load), results in exhaustion and impaired health (McEwen, 2006). The purpose of recovery is to shut off the allostatic response, when it is no longer needed.

Building on the Allostatic Load Theory, Effort-Recovery-Model (ERM) (Meijman & Mulder, 1998) suggests recovery occurs when employees cease working and unwind. ERM posits that employees invest in mental and/or physical effort while working, leading to decreased energy and increased psychophysiological strain. Recovery is the opposite of this straining process, during which the adverse effects of work demands are reversed. ERM further asserts that for recovery to succeed, the psychophysiological resources utilised at work should not be activated during leisure. If an employee constantly engages with work-related tasks or worries about work during free time, the psychophysiological activation remains high, and recovery cannot take place. Insufficient recovery leaves employees in a suboptimal condition where meeting new work-related demands requires compensatory effort, increasing load reactions and further impeding the ability to recover (Geurts & Sonnentag, 2006). Drawing upon the Allostatic Load Theory, ERM suggests that this kind of incomplete recovery, if continuous, leads to accumulation of negative stress effects and results in impairment, illness, or loss of function. Conversely, sufficient recovery acts as a protective component (i.e., buffer) between work-related strain and employee well-being (Geurts & Sonnentag, 2006). Both the Allostatic Load Theory and ERM framework represent the so-called passive recovery perspective, where recovery is seen to occur through the release of work demands and strain, followed by a period of rest (Geurts & Sonnentag, 2006).

In addition to being a passive process, recovery can also be active. An active perspective on recovery (de Bloom et al., 2010; Geurts & Sonnentag, 2006) builds on Conservation of Resources Theory (the COR (Hobfoll, 1998), Broaden-and-Build Theory (Fredrickson, 2001), and Self-Determination Theory (Ryan & Deci, 2000). Together these three theories suggest that recovery can also occur by actively replenishing and restoring internal resources and engaging in leisure activities that are pleasant, self-chosen, and provide experiences of mastery and competence.

First, COR (Hobfoll, 1998) proposes that individuals aim to obtain, conserve, and protect the resources they value most. These resources include, for example, shelter, food, and jobs, as well as internal resources such as skills and energetic and affective resources. According to the COR, stress follows if 1) one is threatened by losing valued resources, 2) faces a loss of valued resources, or 3) fails in resource investment efforts. However, recovery can occur when one actively 1) obtains new resources, 2) protects threatened resources, and/or 3) replenishes depleted resources. Therefore, after a demanding day at work, employees could restore their depleted

resources, for example, by turning off their mobile devices (i.e., protecting threatened cognitive resources) or calling a friend and by doing so, replenish their emotional resources. However, it is worthy of a note that COR puts more emphasis on the general conditions under which recovery can take place rather than focusing on the recovery process *per se* (see Gorgievski & Hobfoll, 2008, for more recovery-related developments of the theory).

Second, Broaden-and-Build Theory (Fredrickson, 2001) suggests that experiencing positive emotions can down-regulate stress reactions in the short term and, over time, help individuals obtain psychological resources (e.g., resilience, social support, or coping skills) that can buffer against future stress. Given their stress-regulating, stress-buffering, and resource-increasing effect, positive emotions are considered to play a role also in recovery, although, Broaden-and-Build Theory did not originally study recovery as such. To further support this view, experiencing positive emotions (e.g., happiness) during leisure activities was later found to contribute to better recovery (Oerlemans et al., 2014). Third, Self-Determination Theory posits that fulfilling basic human needs of autonomy, competence, and relatedness to others reduces distress and improves well-being (Ryan & Deci, 2000; Weinstein & Ryan, 2011). The basic need satisfaction has been argued to have a positive effect on recovery because it leads to energy maintenance or enhancement and is accompanied by positive emotions, which can, as noted by Broaden-and-Build Theory, counteract the stress effect and increase recovery-related resources (van Hooff et al., 2018). Aligning with this, empirical evidence has shown that fulfilling basic needs relates to improved recovery (Mojza et al., 2011; van Hooff et al., 2018; Van Hooff & Geurts, 2014).

Combining the passive and active perspectives on recovery, Sonnentag and Fritz (2007) propose a recovery experiences framework consisting of four distinct psychological mechanisms – i.e., psychological detachment, relaxation, mastery experiences, and control during leisure time – that lead to recovery. Psychological detachment refers to mentally disengaging from work-related demands during non-work time, which can be promoted, for example, by refraining from checking work email or answering work calls during leisure. Relaxation is described as a process of unwinding and slowing down. Relaxing activity requires no physical, social, or intellectual effort and is often accompanied by positive affect. Relaxation can be achieved, for example, through relaxation techniques such as meditation or progressive muscle relaxation, spending time in nature, or listening to music. Mastery experience refers to activities that are challenging but not excessively so, as they would otherwise become stressors. Mastery experiences create learning opportunities and provide a sense of competence and proficiency. Common examples of mastery experience are taking a language class or learning a new hobby. Control is defined as

having the opportunity to choose which activity (or non-activity) to participate in leisure as well as when and how to pursue this activity.

In sum, the recovery experiences framework suggests that recovering activities may be unique, but the underlying psychological mechanisms are uniform across individuals; one might recover by practising yin yoga and another by taking a hot bath, but the underlying experiences (e.g., relaxation) are the same for both.

Building on both passive and active perspectives on recovery, the recovery experiences framework proposes two complementary processes by which recovery can take place during leisure. First, replenishing depleted resources by seeking relief from work demands and slowing down (i.e., detachment and relaxation). Second, restoring and gaining new resources by engaging with activities and experiences that hold recovering potential (i.e., mastery and control). While positively related (Sonnentag et al., 2017), the four recovery experiences have been shown to be conceptually and empirically distinct (Sonnentag et al., 2022). Therefore, they are often examined individually, although some studies have also used the overall recovery experiences score, which combines all four experiences (e.g., Halbesleben et al., 2013; McGrath et al., 2017).

Meta-analytic evidence has positively associated recovery experiences with vigour and negatively with fatigue (Bennett et al., 2018). Similarly, recovery experiences have been found to be positively related to several psychological and psychosomatic well-being outcomes, job performance, and a state of being recovered (for a meta-analysis, see Steed et al., 2021). Recovery experiences are also shown to be beneficial in the short term, as their relationship with sleep and positive/negative affect demonstrate, and in the long term, as their relationship with life satisfaction indicates (Steed et al., 2021), although some studies have reported results that suggest no long-term benefits of recovery experiences (Sonnentag et al., 2017). Moreover, recovery experiences have been shown to explain, for example, the effect of burnout on quality of life (Yang et al., 2020) and physical activity on well-being (Ginoux et al., 2021). In individual recovery experiences, detachment has been found to explain the effects of job demands on fatigue (U. Kinnunen et al., 2011) and job stressors on strain reactions (Sonnentag et al., 2010). Detachment has likewise found to act as a link between a relaxation intervention and better concentration in the afternoon (Sianoja et al., 2018). These findings further support the role of recovery experiences as a key mechanism underlying change in recovery-related outcomes.

More recently, Newman et al. (2014) integrated the recovery experiences framework (and the underlying theories of the Effort–Recovery-Model, Conservation of Resources Theory, Self-Determination Theory) with several other well-being theories, such as Maslow's (1954) hierarchy of needs, Csikszentmihalyi's conceptualisation of flow experience (1990), and Ryff and Keyes' six dimensions of psychological well-being (1995). This development work resulted in the DRAMMA model

(Newman et al., 2014) suggesting that six psychological mechanisms lead to well-being during leisure. These experiences are: Detachment–Relaxation, Autonomy, Mastery, Meaning and Affiliation. The first four experiences are almost identical to recovery experiences Sonnentag and Fritz (2007) suggested, but the last two – meaning and affiliation – extend beyond the recovery experiences framework. In DRAMMA, 'meaning' refers to meaningful leisure activities and experiences by which individuals gain something significant and valuable, whereas 'affiliation' is described as a sense of social connectedness to others. Experiences of meaning could for example be achieved through physical activity, hobbies, or religious/spiritual activities, while affiliation could be fostered by activities such as spending time with friends or playing together. These two dimensions were incorporated in the DRAMMA model as several theories included in the model supported their positive effect on well-being.

Regardless of the DRAMMA model's strong theoretical foundations, the empirical evidence for DRAMMA remains limited (for recent exceptions, see Kujanpää et al., 2021; Virtanen, 2021). Moreover, the relationships between meaning, affiliation, and well-being have demonstrated weaker effects, whereas the effects of relaxation, detachment, autonomy, and mastery on well-being have been more promising (Kujanpää et al., 2021). Therefore, the DRAMMA model was not chosen as a theoretical approach for this thesis. As the recovery experiences framework has, in contrast, been strongly supported by the empirical evidence (e.g., Bennett et al., 2018; Sonnentag et al., 2017; Steed et al., 2021), I chose recovery experiences as the main theoretical framework for recovery (when conceptualised as a process) in this thesis. In Essay 1, recovery experiences frame the narrative review, while in Essay 3, I investigate whether the ACT-based recovery intervention effect on the need for recovery is produced via recovery experiences.

2.1.1.2 Recovery activities

In addition to the underlying mechanisms, recovery as a process approach includes recovery activities (Sonnentag & Geurts, 2009). Recovery activities refer to what individuals do during their time outside work, particularly what kind of activities they engage in (Sonnentag et al., 2022). For example, these activities can include spending time with family, doing household chores, pursuing a hobby, engaging in physical exercise, or conducting work-related duties. Non-work activities have been further divided into high- and low-duty activities (Sonnentag, 2001). High-duty activities (e.g., working or household work) are suggested to provide low opportunities for recovery because of their taxing nature, whereas low-duty activities (e.g., watching TV, exercising, or socialising) are proposed to hold recovery potential as they do not draw on the same internal resources as work.

High-duty activities, especially when job-related, have been associated with low well-being (Sonnentag, 2001; Sonnentag & Zijlstra, 2006), reduced vigour (Ten Brummelhuis & Bakker, 2012), and high exhaustion (Ten Brummelhuis & Trougakos, 2014), whereas low-duty activities have been shown to relate overall well-being (Bakker et al., 2013; Sonnentag, 2001), high vigour (Ten Brummelhuis & Bakker, 2012), and feeling recovered (Ten Brummelhuis & Trougakos, 2014). In general, findings for active low-duty activities (e.g., socialising or physical activity) have been more consistent than findings for passive activities (e.g., reading a novel or watching TV) (Sonnentag et al., 2017).

Furthermore, motivation and affect associated with leisure activities have been shown to matter. To this end, Ten Brummelhuis and Trougakos (2014) observed that intrinsic motivation (i.e., doing something because it is inherently enjoyable and meaningful) for high-duty activities attenuated the negative effects linked with these activities. Similarly, they reported that the relationship between low-duty activities and recovery level was stronger when the motivation was intrinsic compared to extrinsic motivation (i.e., doing something to gain a reward or avoid punishment) for the activity. Oerlemans and colleagues (2014) likewise found that experiencing happiness during high-duty activities offset the negative effects associated with these activities, while low-duty activities were positively associated with recovery only when they were enjoyed. These findings indicate that the harmful effects of high-duty activities and the beneficial effects of low-duty activities on recovery may also depend on how they are experienced.

Non-work activities are also intertwined with recovery experiences, and certain activities can promote or impede recovery experiences. For example, low-duty activities, physical activity, and social activities have been shown to predict high detachment, relaxation and mastery (Hahn et al., 2014; Ragsdale & Beehr, 2016; Ten Brummelhuis & Bakker, 2012). In contrast, using non-work time for job-related activities has been linked with low detachment, relaxation, and control (Hahn et al., 2014; Ragsdale & Beehr, 2016; Ten Brummelhuis & Bakker, 2012). A recent meta-analysis (Steed et al., 2021) showed that low-duty activities were (modestly) related to recovery experiences and a state of being recovered, while high-duty activities demonstrated a weak and inconsistent relationship with low-duty activities, a state of being recovered, and recovery experiences, with the exception of detachment and relaxation dimensions that demonstrated a negative relationship. Since recovery experiences were found to relate positively to a state of being recovered, these findings confirm that recovery activities and experiences are interrelated, yet distinct facets of the overall recovery phenomenon and that engaging in recovery activities and experiences can lead to a state of being recovered (Steed et al., 2021).

However, the restoring effects of non-work activities will likely vary considerably across individuals and occasions (Steed et al., 2021) and perhaps even depend

on how people feel or are oriented (Oerlemans et al., 2014; Ten Brummelhuis & Trougakos, 2014). For example, spending time in wild nature might be relaxing for a nature-lover but not for one afraid of (the thought of) insects, snakes, or other wild animals. Therefore, it has been argued that engaging in certain activities alone does not guarantee recovery; instead, recovery occurs when the non-work activities bring about recovery experiences (Sonnentag & Fritz, 2007). I, therefore, chose to focus on recovery experiences, rather than specific activities in this thesis. Furthermore, I was interested in what follows from having recovery experiences, which led to considering recovery as an outcome; I will address this next.

2.1.2 Recovery as an outcome

Besides being emphasised as a process, recovery has been conceptualised as an outcome of that process. Recovery as an outcome refers to the psychophysiological state reached after a recovery period (Sonnentag et al., 2017). This approach draws attention towards the outcomes of an (un)successful recovery process (Sonnentag & Geurts, 2009) and views recovery as the feeling or state following an engagement with recovering activities or experiences (Steed et al., 2021). For example, expressions such as 'feeling physically refreshed or energetic', 'full of energy', 'recovered mentally', or 'well rested' can describe a state of being recovered (Steed et al., 2021). Feeling recovered during/after a recovery period indicates that successful recovery has occurred and depleted resources have been replenished; therefore, one should have resources available to allocate to new tasks (Binnewies et al., 2009).

Meta-analytic research (Steed et al., 2021) has shown that the state of being recovered has a positive relationship with recovery experiences and work-related resources (e.g., job control, supervisory support) while demonstrating a negative relationship with demands and high-duty activities (e.g., working). Furthermore, the state of being recovered has been found to be positively related to 1) psychological- (e.g., positive affect and mental well-being), 2) psychosomatic well-being (e.g., sleep, general health), and 3) performance (e.g., task performance and organisational citizenship behaviours) (Steed et al., 2021).

As recovery is suggested to not only down-regulate stress reactions but restore energy and replenish internal resources, recovery can manifest in a wide variety of outcomes. Consequently, different psychophysiological measures of health, well-being, and performance can be indicators of an employee's recovery state (Sonnentag & Geurts, 2009). An employee's recovered state could, for example, be captured by assessing vigour in the morning before going to work, measuring heart rate variability at the end of a work break, or asking for self-reported experience of work engagement after a vacation. Specific indicators (e.g., feeling recovered) can also capture a

state of being recovered (e.g., Sonnentag & Kruel, 2006) or the need for recovery (Sonnentag & Geurts, 2009).

The need for recovery refers to the need to recuperate from work-induced fatigue (Jansen et al., 2002). It is characterised by temporary experiences of overload, irritation, and lack of energy (van Veldhoven & Broersen, 2003) and a need for a break from demands (Sonnentag & Geurts, 2009). The need for recovery catches early signs of work-related fatigue and distress (Jansen et al., 2002), marking a transition from normal tiredness to more serious conditions (e.g., burnout) (van Veldhoven & Broersen, 2003). Theoretically, the need for recovery builds on the Effort–Recovery Model (Meijman & Mulder, 1998); thus, it has been argued to be the most likely outcome of (poor) recovery (U. Kinnunen et al., 2019). Empirically, the need for recovery has been shown to predict sickness absence and correlate with, for example, emotional exhaustion and health complaints (van Veldhoven & Broersen, 2003). The need for recovery is often utilised as an outcome variable in recovery interventions (Verbeek et al., 2019) and in this thesis, where the need for recovery was used to indicate the state of being recovered in Essay 3.

2.1.3 Recovery-promoting interventions

Given the rising levels of work-related stress and, conversely, the stress-reversing and well-being-improving effect of recovery, there has been a growing interest in recovery promotion. Prior research suggests that recovery is not a stable trait (Sonnentag & Fritz, 2007) but varies within individuals (e.g., Sonnentag et al., 2008), which supports the argument that recovery is, at least somewhat, a malleable and trainable process (Hahn et al., 2011). Consequently, several studies have provided evidence for the causal relation between training interventions and recovery outcomes. Effective training methods include, for example, recovery-specific-, stress-management-, and mindfulness-based interventions (e.g., Ebert et al., 2016; Hahn et al., 2011; Michel et al., 2014). In addition, there is also promising evidence that spending time in (urban) nature might benefit recovery (Sianoja et al., 2018).

Recovery-specific interventions are tailored to improve recovery directly. For example, Hahn and colleagues' (2011) pioneering study aimed to improve recovery experiences; they reported improvements not only in recovery experiences but in sleep and recovery-related self-efficacy, as well as a decrease in negative affect and perceived stress. In contrast, stress management-based interventions target recovery indirectly by reducing perceived stress and improving stress management. Ebert et al.'s (2016) study, for example, demonstrated that a (mobile) stress-management programme decreased stress, anxiety, depression, emotional exhaustion, insomnia, and worrying while increasing quality of life, psychological detachment, and emotion regulation. Likewise, mindfulness-based trainings target recovery indirectly but

through improving mindfulness skills. Michel et al. (2014) for example, found that online mindfulness training increased detachment from work, improved satisfaction with work–life balance, and decreased work–family-related conflicts.

Although different intervention methods have been shown to result in improved recovery, less is known about the psychological mechanism underlying the change. Existing evidence suggests that, for example, increased acting with awareness (Querstret et al., 2017), improved emotion regulation (Ebert et al., 2016), and experienced enjoyment or psychological detachment (Sianoja et al., 2018) may mediate an intervention's effect on recovery. Also, a decrease in perseverative thoughts (i.e., worrying and rumination) and sleep effort have been reported to act as a mediating mechanism to insomnia severity (Ebert et al., 2015). Taken together, it seems that improved emotion and cognition regulation might explain the change in recovery-related outcomes, but more research is needed before any solid conclusions can be drawn.

Moreover, current recovery intervention research has ignored the potential of ACT training for recovery. Though, mindfulness interventions have proven effective for recovery (Hülsheger et al., 2015; Michel et al., 2014; Querstret et al., 2017), particularly for psychological detachment (Karabinski et al., 2021), prior research has failed to study ACT that incorporates mindfulness processes with commitment- and behaviour change processes (S. C. Hayes et al., 2006). Prior research likewise suggests that cognitive-behavioural strategies can benefit recovery and therefore, ACT – a third-generation cognitive behavioural approach (S. C. Hayes & Hofmann, 2017) – might also hold potential for recovery. Furthermore, previous ACT interventions have been shown reduce employee distress and stress (Unruh et al., 2022), rumination (Dereix-Calonge et al., 2019), exhaustion (Hofer et al., 2018), and burnout (Puolakanaho et al., 2020). Similarly, they have demonstrated improved mood (e.g. anxiety and depression) (Gloster et al., 2020) and well-being (Unruh et al., 2022). Consequently, it seems that ACT intervention can influence the antecedents and consequences of (poor) recovery thus, it could be assumed to benefit also recovery from work. Furthermore, the ACT model allows for the examination of the role of acceptance-based strategies for recovery, as discussed above.

In the next section, I present ACT in more detail and discuss its potential benefits for recovery.

2.2 Acceptance and Commitment Training (ACT)

In the following, I first describe the ACT model and focus on its core component: psychological flexibility. Second, I explore ACT's applications for work through resource-based theories, i.e., Conservation of Resources Theory (the COR of burnout and work engagement (Gorgievski & Hobfoll, 2008), the Job Demands–Resources

Theory (Bakker & Demerouti, 2017), and the Goal-related Context-sensitivity hypothesis (Bond et al., 2006), as Flaxman et al. (2023) suggested. In section 2.2.1, ACT is used in reference to its original therapeutic model, i.e., Acceptance and Commitment *Therapy*; however, in 2.2.2, ACT refers to Acceptance and Commitment *Training*, which is commonly used when ACT is applied in non-clinical settings. Finally, I focus on prior worksite ACT interventions. My research interest and the focus of this thesis centre on the working population, workplace adaptations of ACT, and its preventative rather than curative effects. Consequently, clinical perspectives and outcomes of ACT are addressed only briefly.

2.2.1 The ACT Model

ACT (S. C. Hayes et al., 1999) is a third-wave cognitive behavioural therapy method that seeks to change one's awareness of and relation to uncomfortable inner experiences (e.g., thoughts, emotions, memories, or bodily sensations). Unlike many traditional cognitive behavioural therapy methods, ACT does not seek to alter the content (S. C. Hayes et al., 2006) or frequency of these experiences (S. C. Hayes et al., 2004). Instead, ACT utilises methods (e.g., mindfulness, acceptance, decentering, cognitive defusion, and values) (S. C. Hayes & Hofmann, 2017) to reduce the negative impact these uncomfortable inner experiences often have on individual well-being and behaviour (Ciarrochi et al., 2013). ACT's main target is to improve psychological flexibility: '*the ability to contact the present moment fully as a conscious human being, and to change or persists in behaviour when doing so serves valued ends*' (S. C. Hayes et al., 2006, p.7). Simply put, psychological flexibility refers to an openness to experience uncomfortable inner events while pursuing personally valued patterns of behaviour (Archer et al., 2024).

Psychological flexibility can be cultivated through six ACT processes: 1) acceptance, 2) cognitive defusion, 3) contact with the present moment, 4) self-as-context, 5) values, and 6) committed action (S. C. Hayes et al., 2006) (see Figure 2). Acceptance refers to the willingness to experience all inner events, even if they produce discomfort. Cognitive defusion is defined as putting distance from one's thoughts and noticing them as mental events, not as literal truths. Contact with the present moment refers to being present in this very moment, whereas self-as-a context is a perspective from which to observe inner events without being attached to them. Values are chosen life directions, while committed action refers to engaging in behaviour that aligns with one's values. In the context of recovery from work, psychological flexibility could for example mean that an employee 1) has chosen to value personal well-being, 2) acts accordingly and refuses to constantly work overtime, although it might require: 3) accepting unpleasant inner experiences (e.g., anxiety or fear of negative comments), 4) applying cognitive defusion techniques (e.g.,

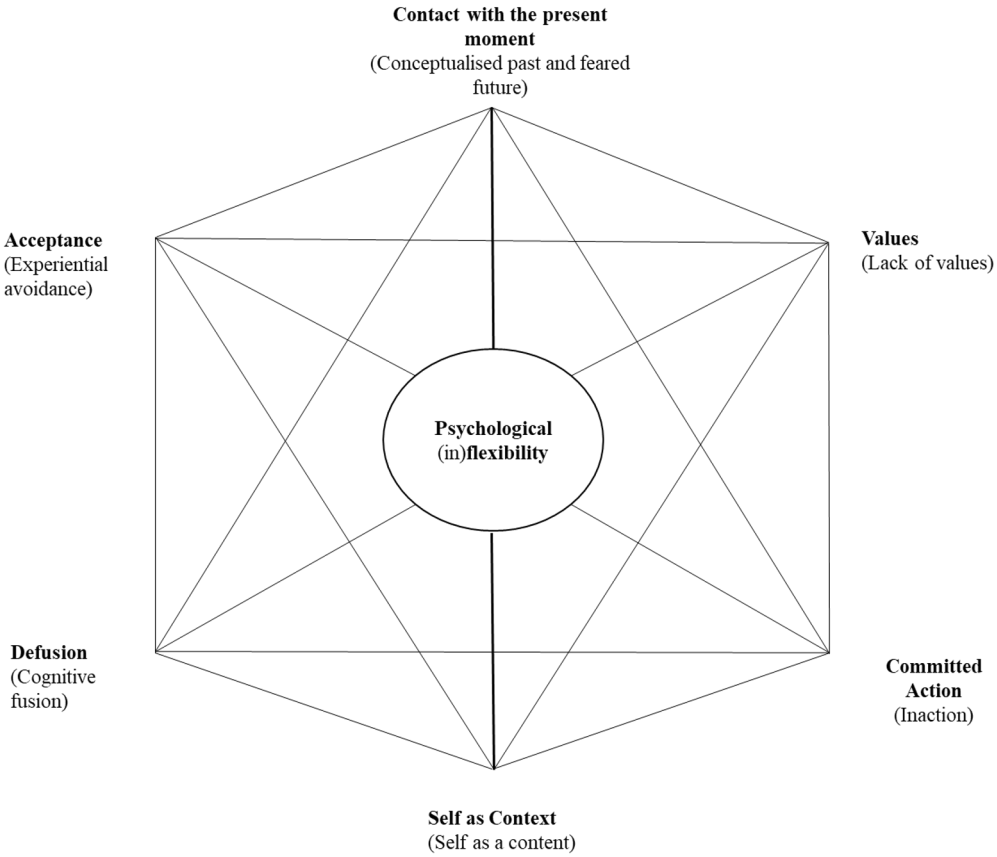
'I am having a thought that I am a bad worker' vs. 'I am a bad worker if I don't work excessive hours'), 5) fostering a self-as-a-context perspective (i.e., becoming aware of the natural flow of these inner events without being attached to them) while also 6) anchoring oneself to the present moment.

These six ACT processes are all interrelated and reinforce one another to produce psychological flexibility (S. C. Hayes, Pistorello, et al., 2012). For example, becoming aware of the present moment supports observing inner experiences as they come and go (i.e., self-as-a-context), making creating distance to these private events (i.e., defusion) easier, and further enhancing the ability to act in accordance with one's values, even when facing internal or external barriers for doing so. The six processes can be further grouped into two broader categories: acceptance and mindfulness processes and commitment and behaviour change processes (S. C. Hayes et al., 2006). ACT is hence defined as a psychological intervention that employs acceptance and mindfulness processes, and commitment and behaviour change processes, to promote psychological flexibility (S. C. Hayes, Pistorello, et al., 2012). It bears noting however that at the model level, ACT is not a technology; any method that fosters the ACT processes (i.e., psychological flexibility) can be included in an ACT intervention (S. C. Hayes et al., 2013).

While psychological flexibility is proposed to promote health and behavioural effectiveness (e.g., S. C. Hayes, Strosahl, et al., 2012), psychological *in*flexibility has been argued to explain a broad range of psychological difficulties and disorders (e.g., Levin et al., 2014). *In*flexibility consists of six processes that act as counterparts to those underlying psychological flexibility: 1) experiential avoidance, 2) cognitive fusion, 3) dominance of past and future, 4) attachment to self-as-a-content, 5) lack of values, and 6) inaction (S. C. Hayes et al., 2006) (see Figure 2). Experiential avoidance refers to suppressing, altering or avoiding unwanted private events, while cognitive fusion is defined as becoming entangled with (negative) inner experiences. Dominance of past and future is described as ruminating about the past or fearing the future. Self-as-a-content means a perspective of being attached to the content of one's mind (e.g., 'I am what my thoughts and memories say I am'; 'Because I experienced burnout, I am a loser who does not know how to recover from work'). A lack of values is defined as being unaware of what matters in one's life, while inaction refers to one's failure to act due to a lack of direction. The ACT theory suggests that *in*flexible behaviour, cognitions, and emotion regulation are the primary causes of psychological suffering, exacerbating many psychological problems (Ong et al., 2024).

Figure 2

A Model of Psychological Flexibility Processes ACT Seeks to Strengthen, Corresponding Inflexibility Processes in Brackets



Note: Based on S. C. Hayes et al.'s (2006) original hexaflex-model of ACT

Given ACT's transdiagnostic nature – i.e., psychological *in*flexibility contributing to the development, maintenance, and worsening of a wide range of psychological problems (Levin et al., 2014) on the one hand, and psychological flexibility enhancing individual well-being and flourishing (S. C. Hayes, Strosahl, et al., 2012) on the other – ACT has proven effective for several conditions. A recent review of meta-analyses with almost 12,500 participants showed that ACT is effective for anxiety, depression, substance use, pain, and transdiagnostic groups (Gloster et al., 2020) In addition, ACT has been found to be more effective than placebo, waitlist control, treatment as usual, and most established psychological interventions, though it has not been found outperform cognitive behavioural therapy (Gloster et al., 2020).

Meta-analytic evidence similarly shows that ACT is superior in life satisfaction/quality (A-Tjak et al., 2015) and subjective well-being (in clinical and non-clinical populations) compared to control groups (Stenhoff et al., 2020). Moreover, aligning with the theoretical assumptions of the ACT model, psychological flexibility has been confirmed to be the mechanism of change in ACT interventions (Ren et al., 2019; Stockton et al., 2019).

However, ACT has also faced criticism, such as its overreliance on a single measure – the Acceptance and Action Questionnaire (AAQ) and its revised version (AAQ-II) – which has been used in most ACT effectivity studies to measure psychological flexibility (Doorley et al., 2020). Simultaneously, the AAQ-II has been critiqued for '*poor discriminant validity with respect to general distress, lack of measurement invariance in clinical vs. nonclinical samples and overemphasis on the experiential avoidance facet of psychological inflexibility'*(Ong et al., 2024, p. 27). Although values are an essential component of the ACT model, they have received less research attention than the other subprocesses of psychological flexibility (Doorley et al., 2020; Kashdan et al., 2020; Reilly et al., 2019). However, studying them would be critical given the central role of values and committed action in the ACT model (Reilly et al., 2019). In addition to the need for multilevel and -component measures of psychological flexibility, previous research has called for more vigorous mediation studies (Stockton et al., 2019) and highlighted the importance of studying positive markers of well-being alongside the distress and ill-being-related outcomes, which have traditionally dominated the ACT research (Flaxman et al., 2023; Ren et al., 2019). Despite these areas of future development, it remains evident that ACT has established itself among the effective treatment approaches for clinical populations.

In addition to clinical use, ACT has been applied to general populations (e.g., the workplace). In this thesis, ACT denotes Acceptance and Commitment *Training,* which refers to the non-clinical application of ACT (S. C. Hayes et al., 2004). This approach is based on the same theoretical principles as Acceptance and Commitment *Therapy*, but instead of being used clinically, it is applied in non-clinical settings like the workplace. In these contexts, the focus is often on psychological flexibility rather than psychological *in*flexibility, especially when targeting effects beyond mental health (Bond et al., 2011) The next two sections discuss worksite ACT in more detail – first, from a theoretical perspective and second, in light of prior evidence.

2.2.2 ACT in the context of work – Resource-based theories

The theoretical foundation for the mental health benefits of worksite ACT programmes is argued to align with the ACT model presented above, but the underlying

rationale for ACT's broader effects on employee health, well-being, and performance is assumed to be different (Flaxman et al., 2023). To understand how worksite ACT might produce its effects beyond mental health, prior research has focused on resource-based theories conceptualising why certain – job or individual – characteristics are associated with work-related stress, motivation, performance, and burnout (Flaxman et al., 2023). In particular, prior research has suggested considering three interrelated theoretical models: Conservation of Resources (COR) in burnout and work engagement (Gorgievski & Hobfoll, 2008; Hobfoll, 1998), Job Demands–Resources Theory (Bakker & Demerouti, 2017), and the Goal-related Context-Sensitivity hypothesis (Bond et al., 2006).

First, one conceptualisation of how worksite-ACT programmes might produce their effect, especially on burnout and work engagement – both of which are also associated with (very) poor or successful recovery, respectively (Sonnentag et al., 2022) – is energetic resource loss and gain spirals proposed by the COR theory (for a more detailed description of the original version of the COR theory, see section 2.1.1.1.) The burnout and work engagement extension of the COR theory (Gorgievski & Hobfoll, 2008) posits that individuals are inherently motivated to protect, maintain, and obtain valuable resources. These resources also include energetic resources (e.g., emotional, physical, and cognitive energies). According to COR, encountering or anticipating energetic resource loss or failing to gain energetic resources after a considerable resource investment induces stress. If prolonged, this kind of energetic resource loss leads to a negative spiral of increasing stress, further depleting resources (i.e., poor recovery) that might, over time, culminate in burnout. Conversely, anticipating or actually gaining resources (e.g., having meaningful relationships) counteracts the resource loss process and activates the energy enhancement spiral. These energy-gain spirals are considered important as they elicit positive health and well-being and support future resource gain (Gorgievski & Hobfoll, 2008).

The COR framework further asserts that although resource loss is more relevant than resource gain, individuals with greater resources, including personal resources, are less vulnerable to resource loss and more able to organise future resource gain (Gorgievski & Hobfoll, 2008). For energetic resources and recovery, this could mean that individuals with certain personal characteristics are less likely to end up in an energy-loss spiral of poor recovery and burnout and are more likely to be able to harness their recovery-related opportunities. The COR theory proposes that such individual characteristics might include cognitive and emotional flexibility and tolerance for failure (Gorgievski & Hobfoll, 2008), both of which are conceptually close to psychological flexibility (Flaxman et al., 2023). This suggests that psychological flexibility could potentially be considered a personal resource that can mitigate the negative effects of energetic resource loss, buffer against future resource loss, and

help individuals gain more energetic resources. So far, only one study has tested the hypothesised role of psychological flexibility as a buffer against resource loss. Kopperud et al.'s (2021) study showed that psychological flexibility mitigated the negative consequences of a leader's work overload on the quality of their relationship with subordinates. While further research is necessary, studying psychological flexibility as a personal resource seems particularly interesting since it can deliberately be improved (e.g. Unruh et al., 2022), unlike many other individual characteristics (Flaxman et al., 2023).

The second theoretical model proposed to explain ACT's effects in the worksite context is the Job Demands–Resources Theory (JD-R), explaining how job and individual characteristics impact employee well-being, performance, and motivation (Bakker & Demerouti, 2017). JD-R posits that all job characteristics can be categorised into job demands or resources. Demands refer to job characteristics or conditions that require sustained effort, including physical (e.g., poor ergonomics), psychological (e.g., meeting with difficult clients), social (e.g., contradictory expectations), and organisational (e.g., organisational changes) demands (Seppälä & Hakanen, 2017). Conversely, resources refer to those aspects of work that provide energy, help meet work goals, and mitigate the negative effects of demands (Bakker & Demerouti, 2017), including physical (e.g., a well-functioning working environment), psychological (e.g., autonomy), social (e.g., supportive working community), and organisational (e.g., job security) characteristics (Seppälä & Hakanen, 2017). In addition to job-related resources, resources include personal resources (e.g., optimism and self-efficacy) (Xanthopoulou et al., 2007).

Like the COR, the JD-R further asserts that excessive demands initiate health impairment process, whereas sufficient resources lead to the motivational process. These dual pathways have also been supported by empirical evidence demonstrating that the health impairment process negatively affects employee well-being and is positively associated with burnout, whereas the motivational process enhances motivation and is positively linked to work engagement (e.g., Nahrgang et al., 2011). A similar pattern has been observed in recovery: Demands demonstrate a negative relationship with recovery, while resources are positively associated with recovery (Steed et al., 2021). JD–R additionally proposes that resources, particularly personal ones, not only instigate motivational paths but can buffer the effect of job demands on strain. Prior research argues that psychological flexibility could qualify as one such personal resource because it meets the JD–R criteria for what constitutes a resource (i.e., facilitates goal attainment; decreases the psychophysiological toll of work demands; fosters personal growth, learning, and development) (Biron & van Veldhoven, 2012). Consistent with the theorised role of personal resources within JD–R, psychological flexibility has been found to attenuate the effect of job demands on emotional exhaustion (Biron & van Veldhoven, 2012; Onwezen et al., 2014) and

performance (Onwezen et al., 2014). It has similarly been shown to weaken the negative effect of work overload on job satisfaction and the positive relationship of overload with the negative affect (Novaes et al., 2018). Although initial, these findings suggest that ACT's effects on work-related well- and ill-being may occur through the buffering effect of psychological flexibility.

The third theoretical approach potentially explaining the ACT's effect beyond mental health benefits is the Goal-related Context-sensitivity hypothesis. This hypothesis suggests that individuals higher in psychological flexibility are likelier to spend less time and resources for avoiding, overanalysing, and regulating unwanted private experiences (e.g., stress or anxiety); thus, they have more cognitive and energy resources available for noticing goal-related and value-consistent behaviour opportunities (at work) (Bond et al., 2006; Flaxman et al., 2023). Furthermore, as psychologically flexible individuals generally do not avoid value-relevant encounters, actions, circumstances, and discussions that may evoke uncomfortable private events, they have a wider set of options for responding effectively and capitalising on these opportunities (Bond et al., 2013). The Goal-related Sensitivity-hypothesis has been supported by studies showing that the beneficial impact of job control on mental health, learning, performance, and absence rates is greater among employees with higher psychological flexibility (Bond et al., 2008; Bond & Bunce, 2003; Bond & Flaxman, 2006).

Given that the Goal-related Context-sensitivity hypothesis associates psychological flexibility with increased capacity for recognising and utilising opportunities to protect well-being and job performance (Flaxman et al., 2023), I argue that it could also be applied to recovery from work. Aligning with the hypothesis, individuals with higher psychological flexibility could be assumed to be less preoccupied with their internal events (e.g., 'I have so much work to do that [I] do not have time for a relaxing walk') and, therefore, have more resources for noticing and harnessing recovery-oriented opportunities (e.g., 'I have a thought that I do not have time for a walk, but perhaps I could get off from [the] bus 5 stops earlier while commuting and walk home… I will try that today!'). Similarly, psychologically flexible individuals may be less prone to avoid actions that evoke uncomfortable inner experiences (e.g., 'I hate to be so stressed out; I better keep myself busy so that I do not have to think about it') if they are personally valued and, consequently, have a wider set for responding effectively to recovery-oriented opportunities (e.g., 'Perhaps, I could accept and allow myself to feel that I am under a lot of pressure right now. However, I will not let feeling stressed prevent me from engaging in activities that may help me to slow down, such as breathing exercises').

In this thesis, I thus draw on the Goal-related Context-sensitivity hypothesis and COR theory on burnout and work engagement that conceptualise psychological flexibility as a malleable, personal resource that provides a wider cognitive-behavioural

repertoire, enables responding to opportunities more effectively, and protects against energetic resource loss (Flaxman et al., 2023). While JD–R similarly shares the conceptualisation of psychological flexibility as a personal resource with the potential to buffer work-related strain, its emphasis is specifically on job demands. As this thesis did not address job demands *per se*, the JD–R perspective was excluded. Consequently, this thesis (i.e., Essay 3) investigates psychological flexibility's role in recovery by examining whether the increase in this capacity explains the effect of the ACT-based recovery intervention on the need for recovery.

Essay 3 is, to the best of my knowledge, the first to study ACT's effect on recovery from work. Moreover, Essay 3 represents the first attempt to examine whether psychological flexibility mediates intervention's effect on recovery. However, several prior worksite ACT interventions have targeted other outcomes, including outcomes and intervention contents that are conceptually close to recovery. For example, Archer et al.'s (2024) recent study investigated ACT's effect on burnout and stress resilience. Although they did not study recovery as such, their intervention included discussions addressing effective recovery behaviours. In the next section, I therefore provide an overview of the evidence base for worksite ACT interventions, particularly those that may be relevant for recovery. For a more systematic review of the research evidence available on prior worksite ACT interventions, the reader is encouraged to refer to Essay 2 of this thesis.

2.2.3 Prior worksite ACT interventions

Worksite ACT interventions have shown to have several beneficial effects on employee well-being and work-related outcomes. First, previous worksite ACT studies have demonstrated a reduction in perceived stress (Hofer et al., 2018; Ly et al., 2014; Puolakanaho et al., 2020); also, meta-analytic research supports worksite ACT's positive effect on stress (Unruh et al., 2022). Previous research similarly indicates that worksite ACT interventions may be especially effective for those with high stress levels (Brinkborg et al., 2011; Flaxman & Bond, 2010b). Similarly, evidence suggests that ACT is beneficial in addressing more severe stress conditions such as burnout (Brinkborg et al., 2011; S. C. Hayes et al., 2004; Puolakanaho et al., 2020), particularly exhaustion (Archer et al., 2024; Hofer et al., 2018; Lloyd et al., 2013). However, it must be noted that not all worksite ACT studies have found an effect on burnout (e.g., Bethay et al., 2013; Reeve et al., 2018). Given that stress and recovery are inherently opposing processes, ACT's stress-mitigating effect suggests it may also facilitate recovery. Moreover, ACT's ability to alleviate burnout symptoms – i.e., the end state of long-term poor recovery – further supports its recovery-promoting potential.

Second, previous worksite ACT studies have also reported improved mental health. For example, worksite ACT interventions been shown to improve general mental health (Macias et al., 2019; Waters et al., 2018), decrease distress (Unruh et al., 2022), and lessen depression (Bond & Bunce, 2000) and anxiety (Jeffcoat & Hayes, 2012). Also, increased general well-being (Puolakanaho et al., 2020) and resilience (Archer et al., 2024) have been observed. As prior recovery research has negatively associated recovery with state negative affect and positively with state positive affect (Steed et al., 2021) and linked recovery with more favourable affective states (Sonnentag et al., 2022), it could be assumed that positive changes in mental health, following for example from an ACT intervention, might also benefit recovery.

Third, worksite ACT interventions have demonstrated improvements in work-related outcomes. While the empirical evidence for work-related outcomes is relatively limited, there is promising evidence that worksite ACT may enhance, for example, work presence and work productivity (Gaupp et al., 2020), personal accomplishment (Luoma & Vilardaga, 2013), active treatment and teaching skills (Pingo et al., 2020), and a propensity to innovate (Bond & Bunce, 2000). As cross-sectional research similarly points to associations between psychological flexibility and work-performance outcomes, worksite ACT might enhance employees' (sense of) effectiveness (Archer et al., 2024). In turn, managing one's work more effectively could be assumed to reduce the required effort, which might contribute to better recovery.

Fourth, previous worksite ACT studies have reported improvements in the psychological flexibility processes. For example, they have been found to increase psychological flexibility (e.g., Hofer et al., 2018; Macias et al., 2019) and decrease psychological inflexibility (i.e., experiential avoidance) (Biglan et al., 2013), cognitive fusion (Puolakanaho et al., 2020), and thought suppression (McConachie et al., 2014). Also, mindfulness processes have demonstrated to improve after worksite ACT intervention (Waters et al., 2018). Aligning with the ACT model, prior research has likewise shown that the intervention effects are produced via improved psychological flexibility (Flaxman & Bond, 2010a; Lloyd et al., 2013; Puolakanaho et al., 2020). In addition, improved mindfulness skills have been reported to explain the intervention's effects (S. M. Kinnunen et al., 2020; Waters et al., 2018). Similarly, and again aligning with the theoretical assumptions of the ACT model, the acceptance of undesirable thoughts and feelings (Bond & Bunce, 2000) and reduced believability of attitudes (S. C. Hayes et al., 2004) have been shown to explain the effect of worksite ACT trainings. Taken together, these findings lend credence to the view that psychological flexibility, or its individual processes, serve as the underlying mechanisms of change also within the worksite ACT interventions.

Overall, the beneficial effects of prior worksite ACT interventions for stress, well-being, and work-related outcomes provide additional evidence to support the

assumption that ACT might also be effective for recovery. Moreover, given that the underlying change mechanisms seem to align with the ACT model also in workplace settings, a similar effect may be expected in the context of recovery. As combining ACT with other training approaches has proven effective (Macias et al., 2019; Puolakanaho et al., 2020), I hypothesised (in Essay 3) that psychological flexibility can be increased by combining ACT with recovery training and that psychological flexibility produces the expected intervention effect on recovery as measured by the need for recovery.

To summarise, Table 2 below presents an overview of the theoretical choices informing this thesis. In the following section, I turn to the methods of this thesis and provide a detailed discussion of the methodology employed in each essay.

Table 2

Summary of the Theoretical Framing of This Thesis

Theoretical approaches used in this thesis		Essay	Role within this thesis
Recovery as a process			
	Recovery experiences (Sonnentag & Fritz, 2007)	Essay 1 Essay 3	Frames the narrative review Integrates the active and passive perspectives on recovery, enables measuring the recovery process, and allows for evaluating the role of diversionary mood regulation strategies in recovery
Recovery as an outcome			
	Need for recovery (Jansen et al., 2002; van Veldhoven & Broersen, 2003)	Essay 3	Enables identifying changes in work-related fatigue and allows for the assessment of recovery as an outcome of recovery training
ACT model	Hayes, Wilsson & Storsdahl (1999)	Essay 2 Essay 3	Provides a foundation for understanding and interpreting ACT in the context of work Underpins a resource-based view of psychological flexibility (see below)
Resource-based theories of psychological flexibility			
	Conservation of Resources Theory (COR) in burnout and work engagement (Gorgievski & Hobfoll, 2008)	Essay 3	Offers a theoretical lens through which to explain ACT's effectivity beyond mental health effects and enables investigation of the role of stress acceptance-based mood regulation strategies in recovery
	Goal-related Context- sensitivity hypothesis (Bond et al., 2006)		

3 Methods

In this chapter I present the methods for all three essays of my thesis: a narrative literature review of recovery-promoting interventions (Essay 1), a systematic literature review of worksite ACT interventions (Essay 2), and an intervention study on ACT-based recovery training (Essay 3). Table 6, page 54, contains the summary of these studies (including design, data, aims and variables, reliability details, and statistical methods, when relevant).

Artificial Intelligence (i.e., ChatGPT) was used in this thesis to assist with proofreading and improving the clarity of the text. At no point was any identifiable or confidential text provided to ChatGPT.

3.1 Essay 1: Narrative literature review

Study 1 comprises a narrative review of recovery-promoting interventions. Although less rigorous than systematic reviews and meta-analyses (Green et al., 2006), a narrative literature review has been suggested to be effective in summarising and synthesising existing research (Bourhis, 2018). A narrative review employs flexible search strategies and qualitative interpretation but does not seek to generalise or cumulate existing knowledge (Pare & Kitsiou, 2017). Nevertheless, it has also been argued to be effective for identifying trends and gaps in knowledge (Baumeister & Leary, 1997) and guiding future research (Green et al., 2006). As Essay 1's aims were to 1) give an overview, 2) provide a qualitative assessment of prior recovery intervention studies and their effects, and 3) pay special attention to moderating and mediating mechanisms and, thus, identify gaps in the current knowledge and provide guidance for future research, adopting a narrative literature review as a research method for Essay 1 seemed appropriate.

3.1.1 Narrative review process

During the review process, I followed Green et al.'s (2006) suggested guidelines for narrative reviews: First, I performed preliminary searches on the topic to refine my research focus. Second, I chose the databases and identified the search terms based on my research aims. The terms were deliberately kept general to align with the

study's aim of providing an overview of the current state of recovery interventions. I also researched recovery-related special issues and performed a reference harvesting of the retrieved literature. The initial search was performed in 2019, and a second was conducted in 2025. Tables 3 and 4 present the databases searched, the other information sources utilised, and the examples of search terms used. Table 3 shows the information sources and search terms used in the initial review in 2019, whereas Table 4 summarises the same information for the 2025 update. Third, I selected articles for a review if they 1) included data regarding recovery interventions and 2) were published in a peer-reviewed journal. Studies that were not in English and those that did not include recovery from work stress or strain but discussed, for example, recovery from illness or physical activity were excluded. No restrictions on publication dates were imposed.

After conducting the searches and study screening, 15 studies met the inclusion and exclusion criteria and were thus reviewed in Essay 1. Most of the articles included were published in the occupational and organisational psychology field, and the publication years ranged from 2011 to 2025. To organise and synthesise the results, I adhered to Baumeister and Leary's (1997) proposed recommendations for narrative reviews; I started by grouping the included recovery interventions into categories based on the training method applied: 1) recovery-specific interventions, 2) interventions based on mindfulness- and cognitive-behavioural strategies, 3) stress management-based interventions, 4) interventions studying nature's recovering potential, and 5) interventions based on physical activity. If the intervention included two intervention groups representing different training categories, it was classified under one category (i.e., Sianoja et al. 2018) or two (i.e., Díaz-Silveira et al. 2023).

This was followed by synthesising and evaluating the evidence base of the studies. The findings of the included studies were also tabulated.

Table 3
Information Sources and Examples of Search Terms Used in Essay 1 in 2019

Databases searched	Finna, Ovid (Psychinfo and Psycharticles), Wiley, Google Scholar
Other sources	Hand searching recovery-related special issues; reference harvesting of the retrieved literature
Examples of search terms used	Work stress recovery; job stress recovery; job strain recovery; work-related stress recovery + intervention; training

Table 4
Information Sources and Search Terms Used in Essay 1 in 2025

Databases searched	Library search portal that covers databases such as APA PsycArticles (EBSCO); Open Access archives; Psychology Database (ProQuest); PubMed / Medline; Scopus; Web of Science - Science Citation Index
Other sources:	Hand searching recovery-related articles
Examples of search terms used:	Recovery from work AND intervention

3.2 Essay 2: Systematic literature review

Essay 2 consists of a systematic review of prior worksite ACT interventions. Systematic reviews, aiming to synthesise all existing research on the topic, are considered to provide high-quality, evidence-based information for research, policy, and practice (Petticrew & Roberts, 2008). By applying detailed, rigorous, and explicit research methods (Green et al., 2006), systematic reviews offer a transparent and less biased review process, leading to more reliable and reproducible results (Petticrew & Roberts, 2008). Furthermore, systematic reviews can be a powerful tool for managing the rapidly increasing volume of data and accumulating evidence (Egger et al., 2022). Since Essay 2 aimed to critically examine the effectiveness and methodological quality of previous worksite ACT interventions, focused on identifying the moderating and mediating mechanisms of these interventions and aimed to provide an overview of the special characteristics of prior worksite ACT interventions, a systematic literature review was used as a method for Essay 2.

3.2.1 Protocol and eligibility criteria

I used the PRISMA 2009 (Moher et al., 2009), and later 2020 (Page et al., 2021), guidelines for systematic reviews to guide this review. Before commencing the study, I created a protocol file documenting, for example, inclusion and exclusion criteria and data analysis methods. All changes made to the protocol during the review process were highlighted and explained in the document.

I included articles for a review if they 1) reported employing ACT intervention and 2) were in the context of work. Studies applying ACT in any other context were excluded. The included studies were also required to study the active working population; therefore, studies including samples, for example, of individuals on long sick leaves or undergoing occupational rehabilitation were excluded. All intervention study designs and delivery formats were included in the review. However, studies

that targeted only mindfulness processes and ignored the value processes of ACT were excluded. Included publications had to be peer-reviewed and contain empirical data. No publication year limitations were imposed, and the manuscripts needed to be in English.

3.2.2 Search strategy and information sources

In this systematic review, I searched four databases: PubMed, PsychInfo, Scopus, and Web of Science. I also identified additional worksite ACT studies by exploring research resources on the Association for Contextual Behavioural Science website listing the majority of published ACT research. I developed the search strategy with the assistance of an information specialist and performed the searches in the spring of 2021. I used the following search strategy to identify studies: acceptance and commitment OR psychological flexibility AND work*, job, occupation*, organisation*, manage*, stress*, strain, staff, employ*, leader, executive or burnout, career, absence. See original Essay 2 for the full search strategies for all databases.

3.2.3 Study selection

After performing the searches and removing the duplicates, 1,521 studies remained. Following the screening of these publications by title and abstract, I included 33 studies for a full-text assessment. I then assessed these 33 potentially relevant studies for eligibility and finally included 29 publications in the systematic review. Four publications were excluded for 1) methodological limitations, 2) a focus on designing rather than implementing an ACT intervention, 3) a student sample, and 4) not applying ACT training but a work reorganisation intervention.

3.2.4 Data collection process and data items

Before conducting the review, I designed a data extraction form that recorded information on study characteristics, study design, type of work context, participants, sample, intervention type, outcome and process measures, effects, and effect sizes when reported. I also collected information on mediating and moderating variables when addressed. Furthermore, I contacted one author of two original papers that utilised data from the same project to clarify the number of participants reported in each study. I performed the data extraction process alone, and no other researchers were included.

3.2.5 Risk of bias in individual studies

To assess the validity of individual studies and evaluate to which extent studies included in the review could evidence a causal effect, I used the six critical conditions framework that Martin et al. (2021) suggested. These six necessary conditions for determining causality include control conditions, sample representation, condition randomisation, condition independence, temporal design, and author involvement. I evaluated each reviewed study based on the six conditions and organised the findings into a tabulated format.

3.2.6 Effect measures

In this review I primarily focused on between-group effects, but also some within-group effects were included. I examined the following effect measures: statistical significance and effect size, i.e., Cohen's *d* and [partial]eta squared. I interpreted Cohen's *d*s per Cohen's (1988) guidelines, where .2 is considered a small effect, .5 a moderate effect, and over .8 a large effect. For eta squares, I similarly followed the recommendations Cohen (1988) suggested, where .01 is considered a small effect, .06 a medium effect, and .14 a large effect. For partial eta squares, I considered .01 a small effect, .0 a medium effect, and .25 a large effect (Hanna & Dempster, 2012). Lastly, if a study employed a qualitative approach, I collected the main findings and themes.

3.2.7 Synthesis methods

First, I created a summary table of the characteristics of the 29 included studies. Second, I grouped the reported intervention effects into four summative categories based on the outcomes reported in the included studies (i.e., work-related positive outcomes, work-related negative outcomes - stress[1] and burnout, mental health and well-being, and psychological flexibility processes). I similarly summarised findings reported for self-guided interventions and qualitative and mixed methods studies. Third, I constructed a summary of coding for worksite ACT studies regarding critical conditions for determining a causal effect, as Martin et al. (2021) proposed. Fourth, I included mediation and moderation variables into psychological mechanisms summary whenever they were reported. Fifth, I organised and tabulated outcome

[1] Technically, stress was not treated as a work-related variable in all of the included studies, as some studies used Perceived Stress Scale (S. Cohen et al., 1983), which does not refer to work. However, as these studies were still conducted for working population and in the context of work, they were included in the negative work-related outcomes category in Essay 2.

measures into seven categories according to the aim of the measuring instrument (i.e., general mental health, anxiety and depression, stress, well-being, negative job-related, positive job-related, training-/context-specific). Sixth, I categorised and tabulated process measures into four groups depending on which psychological flexibility process they aimed to target (i.e., psychological flexibility, mindfulness, values, and training-specific measures).

3.3 Essay 3: Intervention research

Essay 3 involves a quasi-experimental intervention study examining ACT-based recovery intervention, its effects, and the mediating mechanisms. Well-designed intervention research enables the researchers to establish causal relationships and evaluate the effectiveness of a training or treatment (Melnyk & Morrison-Beedy, 2012). It also allows for identifying the underlying processes explaining the change in outcomes (MacKinnon, 1994). Given that intervention research can also inform evidence-based practice (Gitlin & Czaja, 2015), an interventional study design was adopted for Essay 3.

3.3.1 Design and Procedure

Data were collected from two identical ACT-based recovery trainings held across two public sector organisations (i.e., a local municipality and a higher education institution in Southwest Finland). The local municipality employed approximately 1 800 people; the higher education institution 3 300. Participants expressing interest in participating in the intervention were assigned to an immediate ACT group or a waitlist control group. Most of the participants in the higher education organisation were randomly allocated, but in the municipality, difficulties in work schedule arrangements prevented randomisation. Altogether, four separate intervention groups were organised: one ACT and one waitlist control group in each organisation. Three groups were organised face-to-face, as initially planned, but COVID-19 forced the last control group online. However, the content of the online intervention was identical to that of the face-to-face interventions; only the training sessions were delivered on Zoom.

Online questionnaires were distributed at the baseline (T1), at the end of the immediate ACT group's training (T2), at the end of the waitlist-control group's training (T3), and at the 6-month follow-up (T4). The intervals T1–T2 and T2–T3 were each approximately 10 weeks. Furthermore, general feedback was collected at the end of each group's training. Table 5 presents the research design.

It bears noting that, in Essay 3, I focused on the short-term training effects (i.e., the measurement points of T1, T2, and T3). Long-term effects (T4) were considered

to extend beyond Essay 3's primary focus; thus, they are not included in the analysis. Moreover, both groups had received the intervention at follow-up and therefore, detecting between-group effects was no longer possible at T4.

Table 5
Research Design of the Intervention Study

	T1		T2		T3
ACT group	Pre-intervention 1	Recovery training 4x3h bi-weekly	Post-intervention 1		Post-intervention 2
Waitlist control group	Pre-intervention 1		Pre-intervention 2	Recovery training 4x3h bi-weekly	Post-intervention 1

Note: T1 = Baseline

3.3.2 Participants

The intervention was offered to all employees from the two organisations who expressed interest in participating. However, employees amid an acute life crisis or burnout were recommended not to participate and were directed to seek professional support. Study participation was voluntary, and participants were informed they could cancel their participation at any point. Informed consent was obtained from each participant in (digital) writing. While the original sample size target was set at a minimum of 100 participants, COVID-19 disrupted the participant recruitment and delivery of the intervention, resulting in a reduced final sample.

Initially, 65 employees indicated interest in the intervention and were assigned to an immediate ACT group (n = 33) or waitlist control group (n = 32). However, due to participation cancellations during the study, the final sample consisted of 59 participants. Participants were predominantly well-educated women, and the mean age of the study participants was 46.0 (*SD* = 10.3). Most of the participants worked regular hours (35–40 hrs/week), and their ability to work was relatively high (*M* = 7.5/10, *SD* = 1.1). For a more detailed account of participant demographics, see Essay 3.

No significant difference between the conditions was observed at T1 in the baseline characteristics or study variables, except for recovery experiences, for which some confidence intervals indicated significance while the others did not. However, recovery experiences were controlled in the mediation analysis.

3.3.3 Measures

In Essay 3, I focused on recovery as a process and an outcome (i.e., recovery experiences and the need for recovery, respectively). I also examined psychological flexibility.

The Need for Recovery Scale (van Veldhoven & Broersen, 2003) was used as an outcome measure assessing participants' need for recuperation from work-induced fatigue. The scale consists of 11 items (e.g., 'I find it difficult to relax at the end of a working day' or 'A feeling of tiredness prevents me from doing my work as well as I normally would during the last part of the working day'). Response options were measured on a 4-point scale from 1 (Never) to 4 (Always), with higher scores indicating a greater need for recovery and lower scores indicating the opposite.

The Recovery Experience Questionnaire (Sonnentag & Fritz, 2007) was used to measure assessing participants' recovery from work during leisure. The scale consists of 16 items divided into four subscales: 1) psychological detachment (e.g., 'I forget about work'), 2) relaxation (e.g., 'I do relaxing things'), 3) mastery (e.g., 'I seek out intellectual challenges'), and 4) control (e.g., 'I feel like I can decide for myself what to do'). Response options ranged from 1 (I fully agree) to 5 (I do not agree at all), and lower scores indicated higher recovery, whereas higher scores denoted lower recovery.

The Work-related Acceptance and Action Questionnaire (Bond et al., 2013) was used to assess psychological flexibility in the workplace. WAAQ items include, for example, 'I can perform as required no matter how I feel' or 'My thoughts and feelings do not get in the way of my work'. Respondents were instructed to rate their responses on a scale from 1 (Never true) to 7 (Always true), with higher scores indicating greater levels of work-related psychological flexibility.

3.3.4 ACT-Based Recovery Intervention

A certified work and organisational psychologist and I, both of whom had received training in ACT, designed the ACT-based recovery intervention. The intervention comprised a mix of ACT and recovery training. For the ACT component, the training drew on the ACT model and the concept of psychological flexibility (S. C. Hayes et al., 1999). Experiential exercises and techniques included in the intervention were similarly informed by previous ACT (S. C. Hayes & Smith, 2005) and worksite ACT manuals (Bond & Hayes, 2002; Flaxman et al., 2013; Flaxman & Bond, 2006), although none of the prior programmes were followed literally. Regarding the recovery component of the training, the intervention provided the study participants with an introduction to the Effort–Recovery Model and Conservation of Resources frame-

work, recovery experiences, and U. Kinnunen and Feldt's (2009) research on recovery from work. The University of Turku's Ethics Committee approved the research design.

The work and organisational psychologist and I facilitated the training sessions. Participants were also encouraged to actively engage by interacting, asking, and discussing throughout the sessions. Each training session lasted three hours and was organised four times every other week. Altogether, all the study participants received 12 hours of ACT-based recovery training. The study participants were also encouraged to practice 5–10-minute psychological flexibility exercises (e.g., mindfulness-, meditation-, or values-based action exercises) between the training sessions. For mindfulness-based exercises, participants were provided access to online audio resources created by an experienced ACT practitioner not involved in the study.

Each training session began with a brief introduction to different elements of recovery and the ACT model, followed by mindfulness- and values-based action skill exercises. More specifically, the study participants learned how recovery occurs, how it can be promoted, and what hinders recovery. The participants also practised present moment awareness, cognitive defusion, observing-self, and acceptance. The participants also engaged with value clarification, committed action, and value barrier exercises, especially in the context of recovery. For more detailed information on the intervention content, see the original essay.

3.3.5 Statistical Analyses

First, I performed a confirmatory factor analysis (e.g., Brown, 2015) to test whether the data fit the measurement model of the need for recovery, recovery experiences, and psychological flexibility. Next, I created a correlation matrix for the need for recovery, recovery experiences, and psychological flexibility at T1 and T3. Third, I employed a bootstrap estimator for paired t-tests to assess the impact of ACT-based recovery training for all intervention completers (i.e., the change between T1 and T3),

Fourth, I used a two-way mixed Analysis of Variance (ANOVA) to analyse the change between ACT and the control group over time. I analysed recovery experiences, the need for recovery, and psychological flexibility by using 2 x (3) mixed-ANOVA with the within-subjects factor of Time (T1–T3) and the between-subjects factor of Group (immediate ACT- or waitlist control group). Lastly, I performed two distinct longitudinal panel mediation models with two waves of measurement to understand how variation in Group (ACT/control) influences the change in need for recovery over time through changes in recovery experiences or psychological flexibility over time (A. F. Hayes, 2017).

Confirmatory factor analyses were performed with SPSS AMOS 28 Graphics. Descriptive statistics, t-tests, reliabilities (Cronbach's αs), and two-way mixed ANOVA were all analysed using SPSS Statistics 29. PROCESS Macro Version 4.3.1.(A. F. Hayes, 2017) was used to conduct the longitudinal mediation analyses.

Table 6
Summary of Essays 1-3

	Study 1	Study 2	Study 3
Design and data	Narrative literature review (N = 15 articles)	Systematic literature review (N = 29 articles)	Intervention study with a waitlist control group design and 3 measurement points (N = 59)
Research aims	To provide an overview of current recovery intervention studies and their: 1) Main 2) Mediating 3) Moderating effects 4) Methodological quality	To critically examine prior worksite ACT studies and investigate their: 1) Main effects (special focus on work-related outcomes) 2) Methodological quality 3) Mediation and moderation variables 4) Special characteristics regarding study design, methodology, and outcome and process variables	To examine: 1) The effects of Acceptance and Commitment Training (ACT)-based recovery intervention on recovery experiences, the need for recovery, and psychological flexibility 2) The mediating mechanisms for the intervention effects by examining a dual-pathway model of diversionary and acceptance-oriented mood regulation strategies
Main variables			Need for recovery (α = .87–.92) Recovery experiences (α = .87–.91) Psychological flexibility (α = .87–.89)
Main data-analysis	Narrative analysis (Baumeister & Leary, 1997; Green et al., 2006)	Systematic analysis guided by the PRISMA guidelines	Repeated measures t-test; a two-way mixed ANOVA; longitudinal panel mediation model with two waves of measurement (SPSS)

4 Overview of the Results

In this chapter I present an overview of the results of the three essays included in this thesis. Table 10 (pages 66–68) presents the summaries of the exact research aims (Essays 1 and 2), hypotheses (Essay 3), and main results.

4.1 Essay 1

The purpose of the narrative review was to provide an overview of the current recovery interventions, their effectiveness, and the underlying mediating and moderating mechanisms. Thus, the objective was to also identify gaps in the current knowledge and provide suggestions for future research.

The review included 15 articles studying recovery interventions with various training methods. The results show that training interventions can deliberately improve recovery from work, which can benefit employee well-being in several ways. For example, the reviewed recovery interventions reported improvements in sleep, recovery experiences and activities, quality of life, mental health, and affective states. The interventions were further found to support recovery by decreasing worrying, rumination, fatigue, and stress. Also, satisfaction with work–life balance was found to increase and work–family conflict to decrease. In addition, the review's findings provide support for the notion that recovery can be enhanced not only through interventions specifically designed for recovery but by interventions that target recovery indirectly (Sonnentag et al., 2022). In the review, recovery-specific interventions (e.g., training based on recovery experiences) and interventions not specifically tailored for recovery improvement (e.g., mindfulness-, stress management- and nature-based trainings) were found to have positive effects on recovery. As an additional remark and of particular relevance for this thesis, the review also showed that while the effects of mindfulness-based interventions on recovery have been studied previously, ACT's potential in facilitating recovery remains unaddressed.

Moreover, the methodological quality of the reviewed studies was relatively high. The studies reviewed included 2,188 participants, and most of the studies (i.e., 67%) employed randomised and (waitlist) controlled designs. The remaining 20%

utilised quasi-experimental designs, while 13% of the studies reviewed reported using randomisation without a control group, or no randomisation nor control group. The frequent use of randomised and (waitlist) controlled designs provides initial support for the causal relationships between recovery interventions and recovery outcomes.

The review results furthermore show that understanding the underlying psychological mechanisms in recovery interventions remains limited. The findings of this review provide first evidence that efficient emotion and cognition regulation can act as a pathway to improved recovery, but more research is warranted before firm conclusions can be drawn. Also, conditions, populations, and settings in which the recovery interventions are most effective remain largely unexplored. Only one study (Sianoja et al., 2018) reported that fatigue decreased more for those who experienced more exhaustion at the start. However, understanding how, to whom, or under what circumstances these interventions work would be crucial for intervention and theory development and is thus worth studying further.

To confirm and extend the results of this narrative review, future research should prioritise conducting additional well-designed recovery intervention research and focus specifically on increasing the understanding of mediating and moderating mechanisms. Similarly, the field would benefit from more systematic evaluations of the literature.

4.2 Essay 2

The purpose of the systematic review was to critically evaluate and synthesise the evidence on worksite ACT interventions. In particular, it aimed to focus on the work-related outcomes, the underlying moderating and mediating mechanisms, and provide an overview of the special characteristics of the study design, methodology, outcome, and process variables utilised in previous worksite ACT interventions.

The reviewed 29 studies included 2,269 study participants, of which 52% were assigned to ACT-interventions and 44% to control conditions (for 4% of the participants, the group assignment was unclear). The mean age of the participants ranged from 28.75 to 53; most of the participants were female and White/Caucasian. Most of the ACT interventions were aimed at the public workforce (e.g., social and healthcare workers, public employees, educators) or participants from various occupations. Also, interventions focusing on business organisation employees were reported. Most of the intervention participants received purely ACT-based intervention.

Moreover, 62% of the studies reviewed employed a randomised and controlled design. Most of the ACT interventions primarily targeted (di)stress, burnout, or well-

being outcomes, but some work-related objectives were also reported. In-person intervention was the most prevalent delivery method, but digital and bibliotherapeutic methods were also used. The interventions lasted between 4 and 16 hours, and most followed a specific ACT protocol.

Self-assessment was the most commonly used tool to measure outcomes. Almost all studies reported a pre–post effect, with 55% of the studies also reporting follow-up data. The outcome and process measures utilised varied considerably across studies. The used outcome measures could be grouped into seven categories (i.e., general mental health, anxiety and depression, stress, well-being, negative job-related, positive job-related, context/training specific), whereas process measures were grouped into four categories (i.e., psychological flexibility, mindfulness, values, and some intervention-specific measures).

This review revealed that worksite ACT interventions can positively affect the working population in several ways. First, worksite ACT interventions were found to enhance work-related individual characteristics (e.g., teacher's self-efficacy, attitudes towards clients) and behaviour (e.g., active treatment and teaching skills) and drive organisational-level improvements (e.g., increase in non-self-reported work presence and productivity). Second, worksite ACT interventions were shown to reduce stress and burnout. Moreover, as could be expected because of ACT's therapeutic roots, the results demonstrated an increase in mental health and overall well-being outcomes. Worksite ACT interventions lead to improvements in psychological flexibility processes, which aligns with the theoretical assumptions of the ACT model. The effects were also generally maintained over time, with worksite ACT groups typically outperforming the control conditions.

Improvements were observed in self-guided (e.g., digital and bibliotherapeutic) and instructor-guided interventions. The results from qualitative and mixed method studies similarly indicated that worksite ACT interventions were experienced as personally and professionally beneficial, built resilience, and provided a break from daily hassles.

Seven (24%) of the studies reviewed reported investigating a mediation effect. In particular, psychological flexibility and mindfulness skills were found to explain the effects of the intervention. The moderation effect was examined in 2 (7%) of the reviewed studies, and baseline distress was found to moderate the effect in these studies.

However, the methodological quality of the included studies varied across studies. Of the included studies, 72% met the criteria for sufficient sample representation, 72% reported control condition. Condition randomisation was achieved in 90% of the studies which reported a control condition, whereas condition independence was achieved in 67% of the studies that employed a control group. However, 79% of the

studies reviewed did not provide a clear justification for measurement timing. Likewise, in 83% of the papers, the authors were involved in the intervention content development or delivery.

Taken together, the review provides encouraging evidence for applying ACT-based methods to improve work-related outcomes, promote employee well-being, and manage occupational stress. Based on the reviewed literature, it seems that worksite ACT interventions can be delivered effectively with diverse formats, design, and duration. However, further studies are necessary to confirm the results of this review.

4.3 Essay 3

The purpose of Essay 3 was first to investigate the effects of an ACT-based recovery intervention on the need for recovery, recovery experiences, and psychological flexibility compared to a waitlist control group. Second, Essay 3 aimed to examine the role of mood regulation strategies in recovery by investigating whether the effect of the intervention on the need for recovery was produced via diversionary (i.e., recovery experiences) and/or acceptance-oriented (i.e., psychological flexibility) regulation strategies.

4.3.1 Assessing the intervention effect

First, a paired t-test was employed to assess the impact of ACT-based recovery training on all intervention completers. As expected, the need for recovery decreased, and recovery experiences and psychological flexibility improved T1–T3. Table 7 presents these results.

Table 7

Means, Standard Deviations, and Paired t-test for Study Variables at T1 and T3

Measure	Pre-intervention (T1) *M (SD)*	Post-intervention (T3) *M (SD)*	Mean diff.	*t*	*BCa* 95% CI		Effect size (*d*)
					Lower	Upper	
Need for recovery	2.40 (.47)	2.27 (.58)	.14	2.58	.04	.24	.37
Recovery experiences	2.47 (.64)	2.29 (.61)	.18	2.85	.06	.29	.43
Psychological flexibility	5.06 (.84)	5.23 (.84)	-.18	1.87	-.33 [a]	-.02 [a]	.66

Note. n = 49. T = Time; *M* = Mean; *SD* = Standard deviation; Mean diff. = difference in means; *BCa* = Bias-corrected and accelerated bootstrap; *CI* = Confidence interval. a = *BCa* 90% *CI*

Second, a two-way mixed ANOVA was used to examine group differences over time and to investigate whether the differences in the study variables depended on the timing of training (T1–T2 for the immediate ACT group vs. T2–T3 for the wait-list control group). Table 8 shows the results of these analyses. First, and contrary to our expectations, the results revealed a Time x Group interaction that only approached significance for the need for recovery. Figure 3 shows that the need for recovery decreases after receiving the intervention for both intervention groups, but this decrease was not significant. Second, and aligning with the expectations, the results demonstrated a statistically significant Time x Group interaction for recovery experiences. Figure 4 illustrates that both intervention groups improved after receiving the intervention. Third, the results for psychological flexibility unexpectedly showed no statistically significant Time x Group interaction effect. Figure 5 presents these results, where psychological flexibility increases in both groups between T1 and T2.

Table 8

Means, Standard Deviations, and Two-way Mixed ANOVA for Study Variables

Variable	ACT		Control		ANOVA			
	M	*SD*	*M*	*SD*	Effect	*F* ratio	*df*	η^2
Need for recovery								
T1	2.45	.46	2.34	.50	G	.01	1, 46	.00
T2	2.27	.49	2.37	.53	T	3.54*	2, 92	.07
T3	2.28	.59	2.24	.59	G x T	2.41	2, 92	.05
Recovery experiences								
T1	2.60	.72	2.29	.54	G	.23	1, 44	.01
T2	2.29	.62	2.42	.46	T	4.65*	2, 88	.10
T3	2.29	.63	2.24	.62	G x T	6.97**	2, 88	.14
Psychological flexibility								
T1	4.96	.82	5.13	.92	G	.70	1, 45	.02
T2	5.14	.93	5.27	.85	T	2.19	2, 90	.05
T3	5.10	.87	5.37	.82	G x T	.27	2, 90	.01

Note. n varied between 46–48. T = Time; *M* = Mean; *SD* = Standard deviation; ACT = Immediate ACT-group; Control = Wait-list control group

* $p < .05$. ** $p < .01$

Figure 3
Change in the Need for Recovery in the ACT- and Waitlist Control Groups

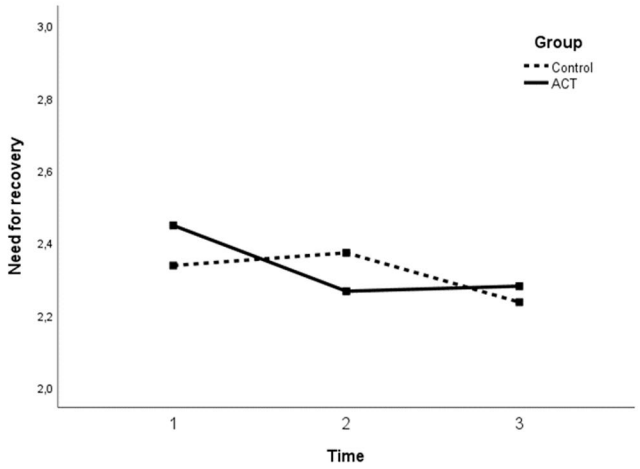


Figure 4
Change in the Recovery Experiences in the ACT- and Waitlist Control Groups

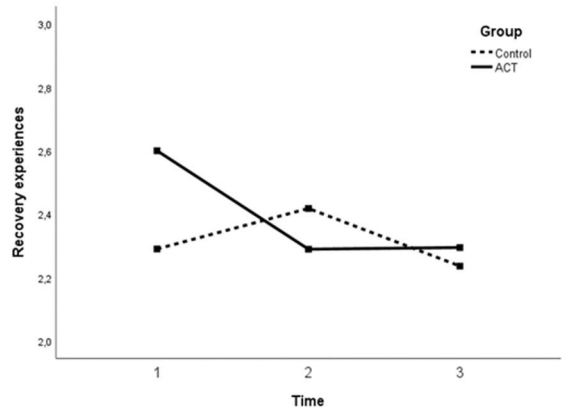
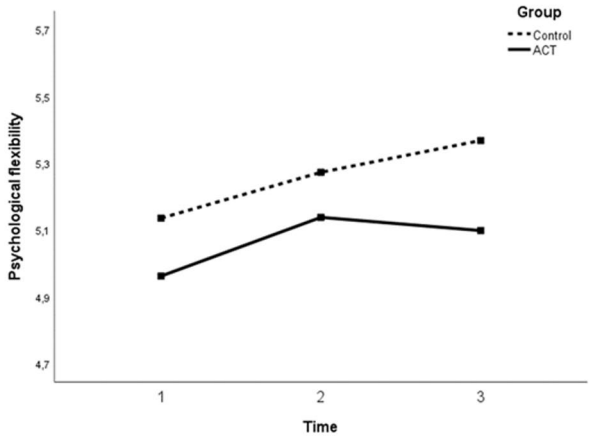


Figure 5
Change in Psychological Flexibility in the ACT- and Waitlist Control Groups



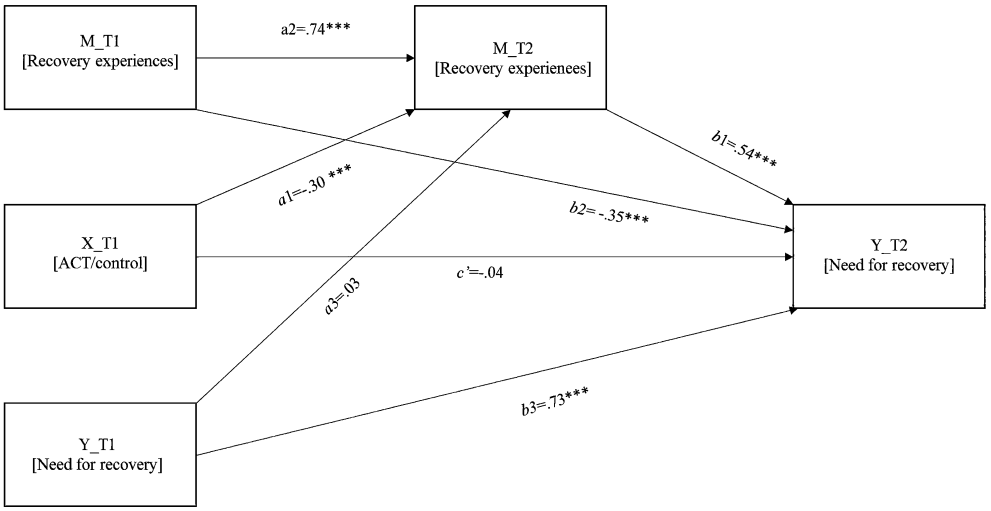
4.3.2 Mediation analysis

To investigate to what extent ACT-based recovery intervention showed indirect effects on the need for recovery via recovery experience and/or psychological flexibility, two separate longitudinal panel mediation models with two waves of measurement were performed (A. F. Hayes, 2017). Figures 6 and 7 illustrate the path diagrams for these two longitudinal mediation models, whereas Table 9 presents the indirect effects.

As expected, the results revealed that the indirect effect of the immediate ACT group on the need for recovery via recovery experiences at T2 was significant. This indicates a mediation effect of recovery experiences on the need for recovery over time. The analyses also showed that compared to the waitlist control group, participation in the immediate ACT group negatively predicted recovery experiences at T2 (NB. in this study, a decrease indicated better recovery). Furthermore, the results showed that recovery experiences (T2) were related to the need for recovery (T2). These findings provide further support for the mediation effect. The results also demonstrated that participation in the immediate ACT group was not related to the need for recovery at T2, indicating that the ACT group effect on the need for recovery was mediated by recovery experiences.

Figure 6

Path Diagram of the Longitudinal Mediation Model of Recovery Experiences With two Waves of Measuring the Need for Recovery

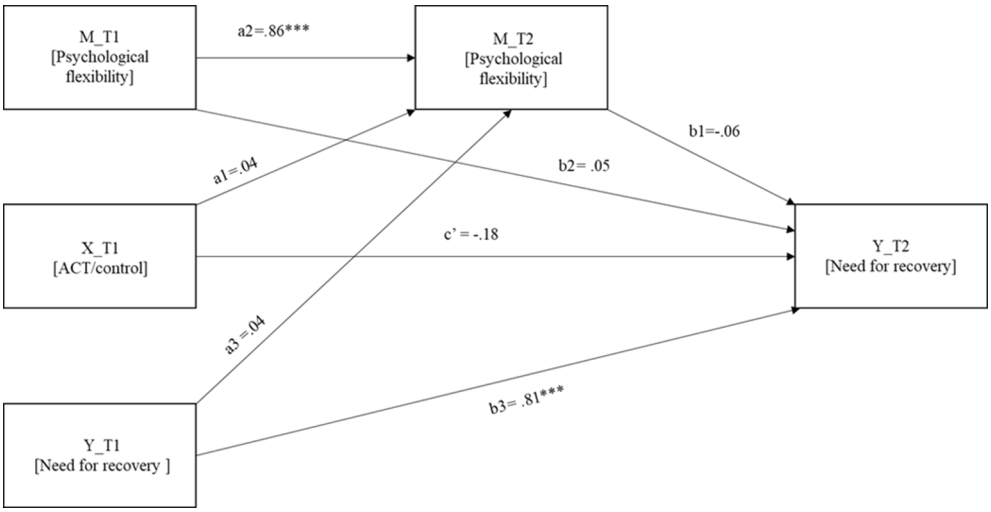


Note. This model included Group (ACT/Control) as the predictor, recovery experiences at T2 as a mediator, and the need for recovery at T2 as the outcome. Baseline measurements of recovery experiences and the need for recovery were added as covariates. *** $p < .01$

However, the indirect effect of the immediate ACT group on the need for recovery via psychological flexibility at T2 was not observed as significant, indicating there was no mediation effect of psychological flexibility on the need for recovery over time. This was contrary to our expectations. The model also revealed that participation in the immediate ACT group did not predict psychological flexibility at T2 compared to the waitlist control group. Psychological flexibility (T2) was neither found to relate to the need for recovery (T2). Furthermore, participation in the immediate ACT group was not related to the need for recovery at T2, indicating no direct effect of the Group (ACT/waitlist control) on the need for recovery. These findings provide further support for the conclusion that there was no mediation effect for psychological flexibility.

Figure 7

Path Diagram of Longitudinal Mediation Model of Psychological Flexibility With two Waves of Measuring Need for Recovery



Note. This model included Group (ACT/Control) as the predictor, psychological flexibility at T2 as a mediator, and the need for recovery at T2 as the outcome. Baseline measurements of psychological flexibility and the need for recovery were added as covariates. *** $p < .01$

Table 9

Indirect Effects of ACT-recovery Training on the Need for Recovery Through Recovery Experience and Psychological Flexibility

	Bootstrap estimates		95% *CI*	
Path	Effect	*SE*	Lower	Upper
ACT → Recovery experiences (T2) → Need for recovery (T2)	-.16	.07	-.30,	-.05
ACT → Psychological flexibility (T2) → Need for recovery (T2)	-.00	.02	-.05	.02

Note. SE = Standard error; CI = Confidence interval

Table 10

Research Aims, Hypotheses, and Results

Essay	Research aims and hypotheses	Results
1 Narrative research	1) Provide an overview of prior recovery intervention studies and their main effects	Training interventions can deliberately improve recovery from work; these interventions can have several beneficial effects on employee well-being. Moreover, it seems that recovery can be enhanced through interventions specifically designed for recovery and interventions that target recovery indirectly (e.g., mindfulness).
	2) Pay special attention to the existing mediating and moderating mechanisms	There is promising evidence that emotion and cognition regulation might produce recovery, but further research is needed. Moderating mechanisms remain mainly unaddressed.
	3) Qualitatively assess the strength of the evidence	The strength of the evidence base is relatively good (i.e., it includes several RCTs), but more research would benefit the field.
	By doing this, identify gaps in the current knowledge and provide guidance for future research.	The potential of ACT in facilitating recovery remains unexplored. Several promising avenues for future research are suggested (e.g., studying optimal intervention dosage and moderating and mediating mechanisms).
2 Systematic review	To critically investigate prior worksite ACT interventions and examine their:	
	1) Main effects, with a special attention to work-related outcomes	Worksite ACT interventions can significantly improve employee mental health and well-being. Also, Psychological flexibility processes seem to improve. Worksite ACT interventions were found to improve positive work-related outcomes, including: 1) Individual characteristics (e.g., attitudes towards clients) 2) Behaviour (e.g., active treatment and teaching skills) 3) Organisational outcomes (e.g., increase in work presence and productivity) Moreover, worksite ACT interventions were shown to reduce negative work-related effects (e.g., stress and burnout).
	2) Methodological quality	Most of the reviewed studies met only four of six critical conditions for establishing causality as Martin et al. (2021) suggested.

Essay	Research aims and hypotheses	Results
	3) Mediation and moderation variables	Psychological flexibility processes seem to mediate the worksite ACT intervention effect(s) and baseline (di)stress to moderate the effect(s).
	4) Special characteristics regarding study design, methodology, outcome, and process variables used in previous worksite ACT interventions.	See the original Essay 2 for the overviews.
3 Intervention Study	H1a: ACT-based recovery training will decrease the need for recovery for all intervention completers between T1 and T3.	The need for recovery was significantly lower at T3 than at T1 (H1a fully supported)
	H1b: ACT-based recovery training will decrease the need for recovery for the immediate ACT group between T1 and T2. H1c: ACT-based recovery training will decrease the need for recovery for the waitlist control group between T2 and T3.	An interaction effect approaching significance was found for the need for recovery, but the effect did not reach statistical significance (H1b and H1c not supported).
	H2a: ACT-based recovery training will produce a positive change in recovery experiences for all intervention completers between T1 and T3.	Recovery experiences decreased between T1 and T3 (H2a fully supported).
	H2b: ACT-based recovery training will produce a positive change in recovery experiences for the immediate ACT group between T1 and T2. H2c: ACT-based recovery training will produce a positive change in recovery experiences for the waitlist control group between T2 and T3.	A statistically significant interaction effect for recovery experiences. Both intervention groups improved after receiving the intervention (H2b and H2c fully supported).

Essay	Research aims and hypotheses	Results
	H3a: ACT-based recovery training will increase psychological flexibility for all intervention completers between T1 and T3.	A statistically significant difference in the mean statistics of psychological flexibility between T1 and T3 (H3a fully supported)
	H3b: ACT-based recovery training will increase psychological flexibility for the immediate ACT group between T1 and T2.	No statistically significant interaction effect for psychological flexibility (H3b and H3c not supported).
	H3c: ACT-based recovery training will increase psychological flexibility for the waitlist control group between T2 and T3.	
	H4: The expected decrease in the need for recovery is mediated by a positive change in the recovery experiences between T1 and T2.	The ACT group effect on the need for recovery was fully mediated by recovery experiences (H4 fully supported)
	H5: The expected decrease in the need for recovery is mediated by improvements in psychological flexibility between T1 and T2.	No mediation effect for psychological flexibility (H5 not supported).

5 Discussion

The findings of this thesis contribute to the existing literature in several ways. In this Chapter, I discuss the findings from all three essays regarding theoretical conceptualisations, prior empirical studies, and the existing gaps in recovery and ACT research outlined in the introductory chapter. I begin by briefly summarising the research focus, main outcomes, and contributions of this thesis. More detailed discussions on the theoretical contributions within recovery (5.1.1) and ACT (5.1.2) literature follow this. Section 5.2 presents the practical contributions, while Section 5.3. focuses on the limitations and future directions of this thesis. Lastly, Section 5.4. provides concluding remarks.

5.1 Theoretical contributions

This thesis aimed to investigate ACT and recovery interventions and their integration. By employing the narrative review method, Essay 1 showed that recovery can be promoted through recovery-specific interventions and interventions not specifically tailored for recovery such as mindfulness. Moreover, Essay 1 found that improved cognition and emotion regulation might explain recovery intervention effects, while moderation effects remain mostly unknown. Thus, Essay 1 contributes towards a better understanding of recovery interventions and their underlying psychological mechanisms.

Second, in Essay 2, I systematically examined the past worksite ACT intervention studies. Essay 2 showed that worksite ACT interventions can have several beneficial effects, especially for those with high baseline stress. Essay 2 found that the beneficial effects of worksite ACT seem to take place via psychological flexibility processes. Simultaneously, Essay 2 revealed a need for greater methodological rigour for future worksite ACT interventions. With these, Essay 2 contributes to increasing understanding of the worksite ACT intervention studies and the psychological processes involved.

Lastly, in Essay 3, I empirically examined ACT-based recovery intervention, built upon recovery experiences framework and psychological flexibility as understood within resource-based theories. Essay 3 showed that ACT-based recovery can improve recovery experiences and psychological flexibility as well as decrease the

need for recovery. Moreover, Essay 3 revealed that the intervention effect on the need for recovery occurred via diversionary regulation strategies (i.e., recovery experiences) rather than stress-acceptance-based strategies (i.e., psychological flexibility). Thus, Essay 3 provides the first evidence that ACT-based recovery intervention can improve recovery. Likewise, it contributes to understanding how recovery interventions might exert their effects.

Table 11 below summarises the key contributions of this thesis. The following sections provide a more detailed discussion of the contributions of this thesis. In sections 5.1.1 and 5.1.2, I first present the contributions of the empirical part of my thesis (i.e., Essay 3), and then proceed to the contributions of my narrative and systematic reviews (i.e., Essays 1–2 respectively).

Table 11
Contributions of This Thesis

Essay	Contributions
Essay 1 (a narrative review)	Showed that recovery interventions can have several beneficial effects, and that recovery can be deliberately improved through direct and indirect training. Identified that efficient emotion and cognition regulation may serve as a pathway to improved recovery. Revealed that moderating effects remain mostly unknown.
Essay 2 (a systematic review)	Showed that worksite ACT interventions can promote employee mental health and well-being. Found that worksite ACT interventions can also increase positive and reduce negative work-related outcomes. Showed that improved psychological flexibility processes explain the change in outcomes. Identified that baseline stress can moderate the worksite ACT intervention effect. Outlined the special characteristics of worksite ACT. Highlighted the need for more rigorous research.
Essay 3 (an intervention study with a waitlist control group design)	Showed that ACT-based recovery intervention can improve recovery experiences and psychological flexibility as well as decrease the need for recovery. Revealed that diversionary-oriented recovery experiences are likely to explain the intervention effect on recovery rather than acceptance-based psychological flexibility.

5.1.1 Recovery intervention research

This thesis provides further empirical support for the most widely used recovery theories: the Effort–Recovery model (Meijman & Mulder, 1998) and the Recovery experiences framework (Sonnentag & Fritz, 2007). Most of the hypotheses grounded in these theories gained support in Essay 3. ACT-based recovery intervention was found to improve overall recovery experiences (i.e., detachment) relaxation, mastery, and control) and decrease the need for recovery. In addition, improved recovery experiences explained the impact of ACT-based recovery intervention on the need for recovery. In other words, recovery experiences mediated the intervention effects on the need for recovery. These findings align with the Recovery experiences framework proposing that having recovery experiences counteract stress and produce recovery. The observed improvements in recovery experiences also align with the findings from earlier recovery intervention studies (e.g., Ebert et al., 2015; Hahn et al., 2011; Poulsen et al., 2015). However, Essay 3 is among the first to support their theorised role as a change mechanism, i.e., mediator in recovery interventions. So far, only one recovery experience (i.e., detachment, has been shown to mediate recovery intervention effect (Sianoja et al., 2018). These findings imply that learning to engage with recovery experiences during off-work time will likely promote employee recovery.

In addition, Essay 3's findings on the need for recovery are consistent with the Effort–Recovery Model, which proposes that working inevitably causes short-term strain and fatigue symptoms, which sufficient recovery can reverse. Essay 3's findings suggest that promoting recovery experiences is one potential method for activating stress symptom reversal and decreasing the need for recovery. Interestingly, despite repeated attempts, earlier recovery interventions have not been able to show an effect on the need for recovery, which has raised concerns about its sensitivity for detecting change (Verbeek et al., 2019). By demonstrating a decreased need for recovery, Essay 3 expands on existing research and suggests that this early indicator of work fatigue and strain (Jansen et al., 2002) may, after all, be modifiable by recovery interventions. Simultaneously, Essay 3 also responds to the recent calls for more intervention-based research on this outcome (Sonnentag et al., 2022).

Furthermore, Sonnentag and Fritz's (2007) Recovery experiences framework posits that recovery will more likely occur through regulation strategies aimed at diverting attention away from stress than strategies based on stress acceptance. Although prior recovery intervention research indicates that emotion and cognition regulation, for example reducing perseverative cognitions, is likely to play a role recovery (e.g., Ebert et al., 2015, 2016; Querstret et al., 2017), no previous studies have, to the best of my knowledge, examined the role of different regulation strategies in recovery. In Essay 3, recovery occurred via the diversionary pathway (e.g., recovery experiences) but not via the acceptance pathway (e.g., psychological flexibility),

which provides initial support for Sonnentag and Fritz's (2007) proposal. This suggests that regulation strategies that direct the attention from work-related stress might be more beneficial for recovery than strategies that aim for stress acceptance. One explanation may lie in cognitive activation. It may be that acceptance processes may maintain (at least while learning them) such cognitive activation and mental focus on the work stressors that will unlikely facilitate recovery (Sonnentag & Fritz, 2007). Seeking distraction from work stress-related cognitive activation and engaging with non-work activities that provide the experience of detachment, relaxation, mastery, and control seem to work better.

In turn, Essay 1 adds to the knowledge regarding recovery interventions more broadly and sheds light on the mediating and moderating mechanisms, which have received no review attention so far. Essay 1 also addresses the growing academic interest in recovery intervention research (Sonnentag et al., 2022). Essay 1's results confirm the view that recovery is at least to a certain extent, malleable and trainable (Sonnentag et al., 2017). Similarly, Essay 1's findings support the notion that recovery can be promoted by interventions specifically tailored for recovery and by interventions that primarily aim to improve other outcomes (e.g., stress management or mindfulness) but indirectly facilitate recovery (Sonnentag et al., 2017). Essay 1's results also indicate that effective cognition and emotion regulation may account for the relationship between recovery interventions and their outcomes. This finding agrees with earlier studies proposing that recovery is closely related to emotion (Parkinson & Totterdell, 1999; Sonnentag & Fritz, 2007) and cognitive energy regulation (Gorgievski & Hobfoll, 2008). Previous studies have likewise associated recovery with favourable affective states (Bennett et al., 2018; Steed et al., 2021). Moreover, Essay 1's results provide preliminary evidence that those currently exhausted might most benefit from recovery interventions. This finding, though initial, aligns with the previous findings suggesting that recovery, although important every day (McEwen, 1998), is most needed when the workload and stress are high (Park et al., 2018; Puterman et al., 2017). However, as recovery has been argued to paradoxically be most difficult when needed most (Sonnentag, 2018), Essay 1's findings suggest that involvement in recovery-focused interventions may be one solution to facilitate recovery when the demands and stress are high.

Finally, this thesis extends on prior research, which has shown that mindfulness is beneficial for recovery (Hülsheger et al., 2015; Michel et al., 2014; Querstret et al., 2017; Reis et al., 2024)) but ignored ACT, which, alongside instructing mindfulness, aims to promote value-directed behaviour (S. C. Hayes et al., 1999). I discuss this in more detail in the following.

5.1.2 ACT for work and recovery

To my knowledge, this thesis is the first study to integrate ACT with recovery training. Although the positive effects on recovery were not exerted via increased psychological flexibility, as would have been expected by the resource-based theories (Bakker & Demerouti, 2017; Bond et al., 2006; Gorgievski & Hobfoll, 2008) and prior studies (e.g., Lloyd et al., 2013; Puolakanaho et al., 2020), Essay 3 still showed that integrating ACT with recovery training can yield favourable results. It is also possible that the lack of mediation effect on psychological flexibility is related to cognitive activation as presented above. Conceptual overlap may also have been influential: Work-related Acceptance and Action Questionnaire (Bond et al., 2013) asks the extent to which people can work effectively while experiencing uncomfortable inner experiences, whereas both Recovery Experiences Questionnaire (Sonnentag & Fritz, 2007) and the Need for Recovery Scale (van Veldhoven & Broersen, 2003) focus on time *after* work. Another explanation may be related to psychological flexibility unexpectedly increasing in both groups between Time 1 and Time 2, which may have contributed to the absence of a detectable mediation effect.

Nevertheless, Essay 3 showed that ACT-based recovery intervention can promote recovery experiences and decrease work-related fatigue and strain. These findings extend upon current worksite ACT research, which has hitherto shown that ACT is an effective method for treating stress conditions (e.g., Brinkborg et al., 2011; Puolakanaho et al., 2020; Unruh et al., 2022) but mainly neglected its potential as a preventative approach to stress (Flaxman et al., 2023). Given that recovery is proposed to stop the accumulation of the negative effects of stress (Meijman & Mulder, 1998), ACT-based recovery intervention may also hold potential for addressing work stress-related ill-being and the related high costs.

Furthermore, Essay 3's results suggest that, alongside improving recovery, participating in ACT-based recovery training can increase psychological flexibility. Although this finding must be interpreted with caution because psychological flexibility unexpectedly improved in both conditions between Time 1 and Time 2, it still provides initial support for ACT-based recovery intervention being able to enhance also ACT processes and the intervention programme being ACT-consistent. This aligns with prior studies showing that integrating the ACT method with other approaches may produce beneficial results while improving psychological flexibility processes (e.g., Bethay et al., 2013; Macias et al., 2019). It also bears noting that the absence of between-group differences from Time 1 to Time 2 in psychological flexibility may reflect the waitlist control group participants' expectations of receiving the intervention in the future (Kirsch, 1997) or the participants' increased self-awareness due to being part of the study (McCambridge et al., 2014). Both future expectations and increased self-reflection may result in positively biased responses among the

participants in the waitlist control group. If so, the intervention effect on psychological flexibility may have been diluted and potentially underestimated in Essay 3.

Lastly, as psychological flexibility was measured by work context-specific Work-related Acceptance and Action Questionnaire (Bond et al., 2013) in Essay 3, this thesis responds to the calls for more intervention-based research on work-related psychological flexibility (Flaxman et al., 2023). ACT theory suggests that psychological flexibility can vary across contexts and situations (S. C. Hayes et al., 1999); however, to date, psychological flexibility has been mainly measured with the general Acceptance and Action Questionnaire (Doorley et al., 2020), which does not account for special contexts (e.g., the workplace). Thus, the Work-related Action and Action Questionnaire is likelier to capture psychological flexibility in relation to work-related stressors, tasks, and goals than the general Acceptance and Action Questionnaire, which has been shown to relate more strongly to mental health outcomes (Bond et al., 2013). Thus, by employing Work-related Acceptance and Action Questionnaire, Essay 3 addresses not only the scarcity of research on work-related psychological flexibility (Flaxman et al., 2023) but the concerns regarding the predominant use of the general Acceptance and Action Questionnaire in prior ACT research (Doorley et al., 2020; Ong et al., 2024).

In addition to examining whether ACT is suited for recovery, Essay 2 advances the current understanding of ACT's relevance and usability in a broader organisational context. Aligning with previous research (Unruh et al., 2022), Essay 2's findings show that worksite ACT can benefit employees' mental health and well-being. This finding is also consistent with the ACT model (S. C. Hayes et al., 2006). Similarly, Essay 2's findings indicate that worksite ACT can increase positive work-related outcomes (e.g., work-related self-efficacy and personal accomplishment) and decrease negative work-related outcomes (e.g., stress and burnout). Positive work-related outcomes may be explained by Goal-related context sensitivity hypothesis (Bond et al., 2006), suggesting that higher psychological flexibility may provide individuals with a wider cognitive-behavioural repertoire that enables responding to work-related opportunities more effectively. Consistent with this, previous studies have found that higher psychological flexibility can predict positive work-related outcomes (e.g., learning and performance) (Bond & Bunce, 2003; Bond & Flaxman, 2006).

In contrast, the improvements in the negative work-related outcomes (i.e., stress and burnout) are likelier to be explained by the ACT model, which proposes that pursuing a psychologically flexible perspective reduces the impact of distressing experiences on individual well-being and behaviour (S. C. Hayes et al., 2006; S. C. Hayes, Strosahl, et al., 2012). The found beneficial effects on stress in Essay 2 agree with previous studies that have shown ACT's favourable effect on stress ((Eklund et al., 2023; Frogeli et al., 2016; Unruh et al., 2022) and stress resilience (Archer et al.,

2024). However, Essay 2's findings concerning burnout disagree with an earlier study that found no pooled effect in favour of ACT compared to control conditions (Reeve et al., 2018). This calls for further research on ACT and burnout, as well as perhaps utilising alternative measurement tools (Flaxman et al., 2023). Nevertheless, Essay 2's findings suggest that ACT may contribute not only to reducing employee ill-being but promoting positive aspects of well-being and behaviour.

Moreover, Essay 2's results expand on previous research by examining mediating and moderating mechanisms in worksite ACT interventions. First, psychological flexibility processes were found to mediate the intervention effects in the context of work. This lends support to the theoretical assumption that ACT is effective not only for psychological conditions but for human functioning more generally (S. C. Hayes, Strosahl, et al., 2012) and, therefore, suited for different populations, including working individuals. Second, Essay 2's results also indicate that employees with high baseline (di)stress are particularly likely to benefit from worksite ACT interventions. This found moderating effect is in line with the theoretical proposals of ACT having a favourable effect on stress conditions (S. C. Hayes et al., 2006; S. C. Hayes, Strosahl, et al., 2012), as noted above. Previous empirical studies have likewise shown that the effects of ACT are more evident among employees with high (di)stress at the onset (Archer et al., 2024; Reeve et al., 2018). Simultaneously, Essay 2's findings, indicating a moderating effect, disagree with a recent meta-analysis (Unruh et al., 2022), where baseline (di)stress showed no moderation in the differences in (di)stress reduction between the active and the control condition. Accordingly, more research is needed to clarify whether baseline stress functions as a moderator or not in worksite ACT studies.

Similarly, Essay 2's findings also demonstrate that worksite ACT can be delivered effectively with diverse formats, design, and duration. For example, worksite ACT interventions were delivered successfully via face-to-face groups, digital platforms, and self-help books. Likewise, the length of effective worksite ACT interventions varied from few hours to trainings organised over several weeks. This aligns, with previous research findings of ACT's effectiveness across different types of training programmes (Flaxman et al., 2023).

Finally, Essay 2's findings highlight a need for more rigorous research, also a concern identified in prior ACT literature (e.g., Reeve et al., 2018; Stockton et al., 2019),. For example, separating the research team from the design and the delivery of the intervention could further improve methodological rigour and reduce potential bias. Overall, Essay 2's findings imply that while valuable research has been conducted over the past two decades on worksite ACT, further high-quality studies are warranted to strengthen the evidence base.

5.2 Practical implications

This thesis also leads to the following practical implications. First, Essay 1 provides an overview of effective recovery training approaches, thus suggesting techniques and activities that individuals interested in improving their recovery can engage with – and perhaps without formal training. For example, mindfulness was shown to benefit recovery in several studies; thus, engaging in mindfulness exercises – easily available for instance online – might be one recommendable strategy to promote recovery. This information might be especially useful as formal recovery trainings may not be widely available yet. Moreover, by identifying change mechanisms across several studies, Essay 1 provides recovery practitioners with insights into which processes or training elements they should focus on to maximise the effectiveness of future recovery interventions. Based on Essay 1's results, concentrating on enhancing emotion and cognitive regulation, for example by introducing techniques that reduce worrying and rumination (e.g., Ebert et al., 2015), is seems likely to yield beneficial results. Similarly, studying moderating effects can pinpoint which individuals are most likely to benefit from recovery interventions, thus enabling practitioners to better target these populations. Although initial, Essay 1's findings suggest that one such group may be those who experience exhaustion.

Second, Essay 2 critically examined ACT interventions in the context of work, thus summarising the key reasons why ACT may also be worth applying more widely in the organisational context. These include the potential to improve employee mental health and well-being, both of which face increasing challenges in contemporary working life. Likewise, worksite ACT interventions were found to improve work-related outcomes (e.g., job performance and productivity), indicating it may also hold the potential for enhancing organisational effectiveness. Furthermore, by studying the underlying mechanisms of change, Essay 2 provides practitioners with guidance on the optimal allocation of training resources, helping them emphasise the most influential elements of worksite ACT interventions. Essay 2's findings confirm that the change in worksite ACT interventions occurs through ACT processes; thus, they also seem worth focusing on in future intervention studies. Studying the moderation mechanisms, furthermore, provides the practitioners with information on the populations, settings, or conditions under which the worksite ACT interventions are most effective. Essay 2 suggests that worksite ACT interventions may be especially beneficial for those who experience distress; thus, targeting individuals with high stress levels may be advisable. Altogether, information from Essay 2 can support evidence-based decision-making and practice.

Lastly, Essay 3's findings suggest that individuals can deliberately learn to promote their recovery, for example by ACT-based recovery intervention. Essay 3 further suggests that cultivating recovery experiences that build on directing attention

away from work stress and strain may be an especially effective method for individuals to employ. In practice, this means that learning to create experiences of detachment, relaxation, mastery, and control during the time off work will likely improve employee recovery. Essay 3 consequently provides, for example occupational health care and organisational well-being units – an evidence-based training intervention that can help employees address work stress and recovery-related challenges. Moreover, as the ACT-based recovery training reduced the need for recovery, which is proposed to capture the early signs of work-related fatigue and distress (Jansen et al., 2002), the intervention may also hold promise for interrupting the negative spiral associated with declining well-being. This suggests that ACT-based recovery training may also help reduce the high costs associated with work-related stress.

To summarise, Table 12 presents the practical implications of this thesis by role.

Table 12
Summary of Practical Implications by Role

	Practical implications
Employing organisations and managers	This thesis summarises the key reasons why ACT may be worth applying more widely also in the organisational context. These include: 1) potential to improve employee mental health and wellbeing as well as 2) improvements in work-related outcomes. Moreover, it seems that ACT-based recovery training can promote recovery and therefore, it may hold promise also for addressing the decline in wellbeing and high costs associated with prolonged work stress.
HR and occupational health care	This thesis provides occupational health care and organisational wellbeing units, an evidence-based training intervention that can help employees to tackle work stress and recovery-related challenges.
Employee	This thesis suggests techniques and activities that individuals interested in improving their own recovery can engage with – also perhaps without formal training. These include recovery experiences (i.e., detachment, relaxation, mastery and control), mindfulness and cognitive-behavioural strategies, stress-management techniques, spending time in nature and potentially, physical exercise.
ACT practitioner	This thesis offers ACT practitioners with guidance on the optimal allocation of training resources and by doing so enables them to emphasise the most influential elements of worksite ACT interventions. It seems that change occurs via ACT processes also in worksite settings, which highlights their relevance for future intervention studies. In addition, it appears that worksite ACT interventions may be especially beneficial for those who experience distress and thus, targeting individuals with high stress levels may be advisable.
Recovery practitioner	This thesis provides recovery practitioners with insights into which processes or training elements they should focus on to maximise the effectiveness of future recovery interventions. Concentrating on enhancing emotion and cognitive regulation is likely to yield beneficial results, and those who currently experience exhaustion, might find recovery interventions especially useful.

5.3 Limitations and directions for future research

This doctoral research is not without limitations. These limitations are discussed individually for each study in the following. In addition, I propose avenues for future research.

First, narrative reviews have been criticised for being less rigorous, less comprehensive and more prone to biases than more systematic review approaches (Bourhis, 2018; Green et al., 2006). It may therefore be that Essay 1 might have been unable to identify all recovery intervention research available. Similarly, as I was the only researcher involved in the research process, biases in the literature screening, selection, and interpretation are possible. In addition to the risk of falling short in validity, narrative reviews have been criticised for limited reliability. For example, they often lack systematic methodology and have limited transparency, both of which further limit the strength of the conclusions drawn from narrative reviews (Green et al., 2006). Consequently, Essay 1 does not claim to provide an exhaustive overview of all previously published recovery intervention research, nor is it designed to evaluate the quality of the evidence in detail (Green et al., 2006).

Instead, Essay 1 attempted to provide a synthesis of the empirical evidence on recovery intervention effects and their underlying psychological mechanisms. While narrative reviews may be limited in methodological quality, they still offer a broader perspective than individual studies, allowing researchers to interpret the findings in a broader conceptual and empirical context (Baumeister & Leary, 1997). Moreover, narrative reviews have arguably offered greater flexibility in searching and synthesising articles (Pare & Kitsiou, 2017), which may make them particularly well-suited for mapping emerging fields, such as recovery intervention research arguably was in 2019 and perhaps still is.

Future research should nevertheless conduct more systematic review efforts on recovery interventions. This would not only provide more reliable evidence of recovery interventions and their effectiveness but potentially increase the understanding of the underlying psychological mechanisms. Currently, there may not be enough rigorous recovery interventions (i.e., randomised controlled trials) available; however, when this stage is achieved, a meta-analysis will advance the field even further. Similarly, the small number of studies included in the current review (i.e., 15 studies) limits the strength of the conclusions that can be drawn from this study's results. As more systematic literature review methods tend to provide more robust results, employing such approaches would be advisable.

Certain limitations can also be associated with Essay 2 (i.e., the systematic review). The studies included in the systematic review varied in methodological quality; therefore, the review findings should be interpreted with some caution. Although this can somewhat be considered a limitation, Essay 2 intentionally aimed to extend

beyond previous meta-analytic work (Unruh et al., 2022) and add knowledge by exploring worksite ACT intervention studies across diverse samples, formats, and levels of methodological rigour. Furthermore, most of the studies reviewed used self-reported measures, thus demonstrating only employee self-perspective and ignoring the effects of ACT processes beyond the individual level, including assessments from managers or team members regarding employee behaviour, which could further enhance our understanding of the phenomenon. Similarly, participants in the reviewed studies were predominantly educated White females, raising concerns about the generalisability of the findings to other demographic groups. The reviewed studies also mainly employed quantitative methods; therefore, whether a qualitative approach could provide a more nuanced understanding of the topic remains to be seen. There have been recent calls for work psychology to utilise qualitative methods more widely (Spector & Pindek, 2016); thus, future research could, for example, qualitatively examine how the study participants experience worksite ACT interventions. Moreover, the review was limited to published and peer-reviewed manuscripts in English. This may have omitted potentially relevant non-English articles and unpublished material (e.g., doctoral theses). Lastly, as with any other literature review, it is also possible that not all potentially relevant studies were identified.

Regarding review-level limitations in Essay 2, it should be noted that only one researcher (i.e., the author of this thesis) performed searching, screening, selection, reviewing, and analysing the literature, meaning the review findings may be subject to biases. However, particular attention was given to maintaining objectivity and transparency throughout the review process. For example, I followed the PRISMA guidelines (Page et al., 2021), defined the search strategy and inclusion/exclusion criteria before commencing the study, and maintained a protocol document. Employing more advanced review methods (e.g., meta-analysis) could have also enhanced the quality of the review. Conversely, opting not to use meta-analytic methods allowed for a broader scope of analysis and the inclusion of heterogeneous study types. In turn, this enabled exploring questions that extend beyond those which can and have been (Unruh et al., 2022) addressed through statistical review methods.

The findings of the systematic review propose several directions for future worksite ACT research. First, these findings indicate a clear need for research demonstrating greater gender diversity, a wider variety of ethnicities, and job descriptions. For example, studying immigrant blue-collar workers who identify as males could advance our understanding of whether ACT is also perceived beneficial by groups not traditionally represented among worksite ACT intervention participants. Second, future research should consider utilising non-self-reported measuring instruments. Future research could use more objective physiological monitoring instruments (e.g., wearable smart devices) to investigate biological responses during

and after worksite ACT intervention. Alternatively, the research could include organisational outcomes (e.g., productivity or client satisfaction) to measure whether worksite ACT improves not only one's *sense of* effectivity but in objective work performance indicators (e.g., Archer et al., 2024). Lastly, further systematic or meta-analytic research is required to confirm the findings of Essay 2 and investigate the effectivity of worksite ACT interventions beyond the effects examined in prior meta-analytic work (Unruh et al., 2022).

The intervention study (i.e., Essay 3) also contains limitations. First, the sample size in Essay 3 was modest, which might limit the generalisability of the study results (Faber & Fonseca, 2014) and increase the risk of Type II errors (Columb & Atkinson, 2016). However, most of the hypotheses for Essay 3 were supported, suggesting that the small sample size may not pose a major limitation. Essay 3's sample size similarly exceeds the average number of participants in previous worksite ACT interventions (average n = 50.6; range: 11–177) (Unruh et al., 2022), although it remains smaller than the average number of participants in prior recovery interventions (average n = 145.9; range 66–393) (Essay 1 in this thesis).

Second, there are also limitations associated with study variables in Essay 3. For example, recovery experiences were combined together in Essay 3 and therefore, they were not examined individually. This limits the interpretations to the overall recovery experiences score and does not allow comparison between the individual experiences (i.e., detachment, relaxation, mastery and control). Although recovery experiences are typically examined individually (Sonnentag & Fritz, 2007), there are also other studies that have utilised a combined score (Halbesleben et al., 2013; McGrath et al., 2017). It may also be worth considering to what extent all recovery experiences represent diversionary regulation strategies. Although they have all been conceptually suggested to be grounded in diversionary strategies (Sonnentag & Fritz, 2007), it is possible that certain recovery experiences function more strongly as diversionary strategies; for example, detachment may do so more often than the others. In addition, Essay 3 included only one outcome variable (i.e., the need for recovery), and it is possible that this outcome has some conceptual overlap with the suggested mediator (i.e., recovery experiences). To address this, previously validated measurement instruments were employed, and baseline levels of the study variables were controlled for in the mediation analysis. Furthermore, confirmatory factor analysis indicated that the study variables loaded onto their respective factors as expected. Taken together, these findings suggest that conceptual overlap is unlikely to be the reason for the mediator effects reported in Essay3.

Third and regarding the study participants, only half the intervention participants were randomly assigned. However, when comparing the immediate ACT group and the waitlist control group, no significant differences between the groups were observed in the study variables. Initial levels of the main study variables were also

controlled in the mediation analysis. Furthermore, organisational concerns and constraints also challenged (random) participant allocation in the previous worksite ACT studies (Archer et al., 2024; Waters et al., 2018); this was also the case for Essay 3: difficulties in staffing arrangements prevented randomisation in one of the participating organisations. In addition, the COVID-19 lockdown forced one intervention group to be arranged online; thus, its intervention delivery method differed from the other three groups. However, the participants in the online group were generally satisfied with the digital delivery format, and the general feedback indicated that their self-reported skill development in ACT and recovery was equivalent to those observed in the face-to-face groups. Likewise, the findings of Essays 1 and 2 in this thesis demonstrate that worksite ACT programmes and recovery interventions can be delivered effectively in person and online. This further supports the argument that the digital delivery of the intervention may not have negatively affected the online participants. Moreover, most of the study participants were White, educated females. Although this reflects the general demographics of the public sector (Maczulskij, 2013) (i.e., the study population), Essay 3 would certainly have benefited from a more diverse sample. Similarly, as participation in the study was voluntary, the sample may not represent the average worker, but rather individuals with a special interest in recovery, training or self-improvement. However, this limitation is common among studies that rely on voluntary participation (Hiratsuka, 2025).

Fourth, all data in Essay 3 was based on self-administered questionnaires. Although self-reporting is commonly used in intervention research, including other data sources (e.g., family members' assessment of study participant's need for recovery) would offer new insights into recovery and its multiple facets. In addition, although Essay 3 analysed change over time, it did not examine follow-up data. However, including a follow-up assessment would advance the understanding of the long-term effects of ACT-based recovery intervention. Adding a follow-up assessment would be especially important since it has been shown that the effects of ACT on stress (Unruh et al., 2022) and poor recovery (i.e., burnout) may take time to develop (S. C. Hayes et al., 2004; Lloyd et al., 2013). Similarly, there is limited understanding of how long recovery intervention effects can be maintained over time (Essay 1 in this thesis). Lastly, as the intervention included both ACT and recovery training, it remains uncertain whether the observed effects can be attributed to ACT, recovery-training, or their combination. While mediation analysis can provide indications of underlying mechanisms, it does not allow drawing firm conclusions about which method is more effective.

Essay 3's results suggest several new avenues for research. Essay 3's findings provide a starting point for more comprehensive and vigorous research (e.g., randomised controlled trials). Future research could for example randomly assign participants into three groups (i.e., recovery training, ACT training, and a control group)

and examine potential differences between the groups in recovery-related outcomes (e.g., the need for recovery). Researchers could also conduct future studies with broader range of recovery-related outcome variables – such as work-related worrying (e.g., Ebert et al., 2015), sleep (e.g., Reis et al., 2024) or stress (e.g., Almén et al., 2020) – which may, among others, reveal alternative mediational paths. Similarly, future investigations could consider examining individual recovery experiences. Researchers could for example examine the role of detachment in mediating the intervention effect. Moreover, future research might investigate the potential impact of the intervention delivery method by comparing the effectiveness of in-person and online recovery training interventions.

To complement self-reported data, future research could also draw on less-subjective recovery measurements such as biological markers (e.g., heart rate variability, blood pressure, cortisol level) or assessments provided by others (e.g., family members, colleagues or supervisors). Examining recovery experiences qualitatively would also be beneficial for future research. Researchers could for example conduct interviews with study participants to explore what aspects of the intervention they found most beneficial and what factors might have facilitated applying the learned content in practice. This could provide new insights into subjective experiences and interpretations of recovery intervention effectiveness and implementation. Lastly, the long-term effects of ACT-based recovery intervention deserve further research attention. Longitudinal research could provide a more detailed picture of how intervention effects on ACT and recovery processes develop over a longer time period.

As a final remark, although this thesis concentrated on the individual-focused recovery processes, future studies should consider the role of organisations in recovery. Namely, the question remains is it – and should it be – solely the employee's responsibility to optimise recovery? Especially, when the need for recovery is practically always work-related. That is to say, strain, stress and ill-being arising from socio-political systems and structures, such as excessive working hours or bad leadership, cannot be cured only by employee self-improvement (Wrenn, 2022) or recovery-optimisation. Favouring only individual-focused interventions can, likewise, give a rise to a situation where the individual is considered as both the origin and the solution to stress, and the systemic and structural root causes of stress and illbeing are left unaddressed (Wrenn, 2022). Therefore, to truly address the challenges of the modern working life, organisational and system-level changes are needed (Telford & Briggs, 2022) alongside individual-focused attempts.

5.4 Concluding remarks

My thesis aimed to investigate recovery and worksite ACT interventions, particularly their integration. To achieve this goal, I reviewed and synthesised prior recovery intervention literature; critically examined previous worksite ACT studies, and empirically investigated an ACT-based recovery intervention.

This thesis contributes to the literature in several ways. First, Essay 1 provides support for the view that direct and indirect training can improve recovery. Furthermore, Essay 1's results indicate that improved cognition or emotion regulation may serve as a mediating mechanism in recovery interventions. Second, Essay 2 demonstrates that worksite ACT interventions are effective for improving employee mental health, well-being, and work-related outcomes. Likewise, Essay 2's results lend credence to the assumption that ACT processes drive the change in worksite ACT interventions. Third, Essay 3 showed that recovery and ACT processes can be improved by ACT-based recovery intervention However, recovery promotion seems to occur via recovery experiences, rather than psychological flexibility. This suggests that combining ACT with recovery training can promote recovery, but the change might not occur through ACT processes. Instead, recovery experiences, as expected within the recovery experiences framework, seem to explain the recovery improvement. These findings align with the theoretical assumption that diversionary regulation strategies (e.g., recovery experiences) are likelier to produce recovery than stress acceptance-based strategies (e.g., psychological flexibility) (Sonnentag & Fritz, 2007).

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