

Internal Interruptions at Work

Discovering a new Perspective on the Antecedents and
Consequences of Interruptions at Work

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Abstract

This dissertation investigates internal interruptions at work, one of the main drivers of multitasking behaviour. The four empirical studies cumulated in this dissertation examine the preconditions to internal interruptions at work, the reasons behind why individuals interrupt themselves, the strategic advantage of internal interruptions, and impact of internal interruptions on performance. The main goals of this dissertation are to uncover the underlying processes of internal interruptions and observe it in real work settings. The first study meta-analytically investigates human energy at work and thereby uncovers a jangle fallacy in the phenomenon of human energy. It moreover sheds light on the possible inhibitor of internal interruptions. The second and third study highlight why people interrupt themselves using a multimethod approach and investigate the strategical use of internal interruptions as energy management strategy by using a daily diary design. The fourth study examines how internal interruptions affect creative and planning performance. Taken together, the studies observe and examine internal interruptions from multiple angles with different methodological approaches and help to disentangle the phenomenon of internal interruptions in a working context.

Zusammenfassung

Diese Dissertation untersucht interne Unterbrechungen bei der Arbeit, eine der Hauptursachen für das Multitasking-Verhalten. Die vier empirischen Studien, die in dieser Dissertation zusammengefasst sind, untersuchen die Voraussetzungen für interne Arbeitsunterbrechungen, die Gründe für solche Unterbrechungen bei der Arbeit, den strategischen Vorteil und die Auswirkungen interner Unterbrechungen auf die Arbeitsleistung. Die Hauptziele dieser Dissertation bestehen darin, die den internen Unterbrechungen zugrunde liegenden Prozesse aufzudecken und sie in realen Arbeitssituationen zu beobachten. Die erste Studie untersucht meta-analytisch die menschliche Energie bei der Arbeit und deckt damit einen Trugschluss im Phänomen der menschlichen Energie auf. Darüber hinaus wirft sie Licht auf mögliche einschränkende Faktoren für interne Unterbrechungen. Die zweite und dritte Studie zeigen mit einem multimethodischen Ansatz auf, warum Menschen sich selbst unterbrechen. Außerdem werden die Studien dazu genutzt mit Hilfe eines Tagebuch-Designs den strategischen Nutzen interner Unterbrechungen als Energiemanagementstrategie zu untersuchen. Die vierte Studie untersucht, wie sich interne Unterbrechungen auf kreative und planerische Arbeitsleistung auswirken. Zusammengenommen beobachten und untersuchen die Studien interne Unterbrechungen aus verschiedenen Blickwinkeln mit unterschiedlichen methodischen Ansätzen und helfen, das Phänomen der internen Unterbrechungen in einem Arbeitskontext genauer zu beleuchten.

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List of Abbreviation

ADACL	Activation-Deactivation Checklist
ANOVA	Analysis of Variance
ART	Action-Regulation Theory
CFI	Comparative Fit Index
COR	Conservation of Resources Theory
ICC	Intraclass Correlation
ICT	Information and Communication Technology
EMS	Energy Management Strategy
RMSEA	Root Mean Square Error of Approximation
SDT	Self-Determination Theory
SEM	Structural Equation Modelling
SMVM	Shirom-Melamed Vigor Measure
SRMR	Standardized Root Mean Square Residual
UWES	Utrecht Work Engagement Scale
WDQ	Work Design Questionnaire

1 Introduction

Since I was a child, I remember people talking about how multitasking is bad for performance, and one should only be doing one task at a time. Phrases such as “nobody can truly multitask,” or “only women know how to work on several tasks simultaneously” were said on TV, among friends, and in the classroom. Even at such a young age, it became obvious that working on different tasks at the same time, and thus not focusing on a single task, should have negative consequences for performance as well as well-being. Nowadays, I ask myself how one can only work on one task at a time, especially in the office, where emails, phone-calls and an increased workload characterise the everyday work life? Besides the idea that multitasking has become a logical consequence of our daily work-life, I ask myself if multitasking always results in all the negative consequences people talk about?

More recently, our work environment has shifted from working in local offices where phone calls could only be attended at the desk itself, towards a world where our ‘offices’ can be located at anywhere and anytime around the globe, as long as we have our laptops or smartphones at hand (Zimber & Rigotti, 2015). This development is highly influenced by the world wide web and the benefit of accessing immediate information whenever and wherever. Moreover, information and communication technology (e.g. Smartphones, Laptops) bring up the possibility to be connected to work anywhere. These new technologies enable employees to be available for incoming calls or emails in the office, during meetings, during home office hours, or even on a day off (David et al., 2014). These possibilities result in a number of risks and an increase in work demands (e.g. checking e-mails during a meeting or attending calls in the evening). Constant multitasking and task switching is the result of this increase in work demands, combined with the societal norm of never switching off (Adler & Benbunan-Fich, 2013). When constant multitasking increases, working on one task without interruptions becomes less and less usual in our daily work life. Research shows that employees multitask at

work and experience frequent interruptions up to every 11 minutes during work (Dabbish, Mark, & González, 2011; González & Mark, 2004; Jin & Dabbish, 2009).

Multitasking behaviour is described as individual behaviour patterns or strategies, where at least two actions with independent goals are performed in a defined period of time, and include multiple task switches between independent tasks (Zimmer & Rigotti, 2015). Multitasking also includes working on multiple tasks which similarly lead to successfully accomplishing a higher work goal (Salvucci, 2005). Multiple demands at work and simultaneous tasks increase multitasking behaviour (Adler & Benbunan-Fich, 2015). However, there are a variety of reasons for why employees start to multitask at work. For example, external stimuli can distract the employee from one task (e.g. incoming phone call, or a colleague dropping by the office) leading towards a secondary task that directly interrupts the workflow of the first task. Secondly, employees can decide to switch between tasks (e.g. stop working on a difficult pitch to write emails) and thus exhibit multitasking behaviour without any external stimuli being present (Adler & Benbunan-Fich, 2013; Baethge, 2013; Fisher, 1998). Whereas external interruptions causing task switches are relatively easy to observe and investigate (e.g. the number of phone calls), internal interruptions causing task switches, through thought processes, physical needs, or emotional states (e.g. remembering an important phone call), are rather difficult to study (Baethge, Rigotti, & Roe, 2015). These difficulties led to an imbalance in the research on interruptions, resulting in less research on internal interruptions than on external interruptions (Baethge et al., 2015).

Besides the lack of research on internal interruptions, internal interruptions are crucial to understand as they occur frequently during a work day, influence employee work behaviour and can indeed be differentiated from other reasons for multitasking e.g. external interruptions (Baethge et al., 2015; Fisher, 1998; González & Mark, 2004; Jett & George, 2003; Jin & Dabbish, 2009). Understanding the underlying processes of internal interruptions can help

organisations and researchers to get a different perspective on multitasking at work. When considering the negative aspects of multitasking, one should try to eliminate distracting sources. This is relatively easy for external interruptions (minimizing external stimuli by, for example, shutting down the email program), but difficult for internal interruptions, especially as we do not really know yet why people interrupt themselves in their work environment. Moreover, we do not know if multitasking caused by internal interruptions has the same negative consequences as multitasking caused by external stimuli, thus it is rather questionable if the goal should be to prevent internal interruptions in general. Thus, it is important to understand how internal interruptions work, why they occur and how they influence work, as understanding these relationships will help to handle internal interruptions at work effectively.

Investigating internal interruptions can help to understand underlying processes and thereby provide new insights into the multitasking research. Thus, this dissertation incorporates discovering why people interrupt themselves at work and how those interruptions influence work performance, as the primary objectives. Moreover, I integrate internal interruptions into the resources literature by postulating that internal interruptions are dependent on personal resources and that internal interruptions might be strategically used for resource conservation. Thereby, I identify an underlying process that helps to describe how internal interruptions influence our experiences during the daily work-life. To guide through the four studies of this dissertation, I will first highlight why it is important to investigate internal interruptions by differentiating internal interruptions from other related concepts. Next, I will provide some information on the state of current knowledge on internal interruptions and discuss the role of human energy in this context. Lastly, I will present the research questions for this dissertation and provide a short overview of each study.

1.1 Interruptions at Work

Interruptions at work can be defined as a suspension of goal-directed behaviour, and are phenomena that can disrupt the workflow of an individual and cause multitasking behaviour (Adler & Benbunan-Fich, 2015; Brixey et al., 2007). Interruptions include changes of focus from a primary task towards a secondary task, and then the resumption of the primary task (Brixey et al., 2007). They can either be caused externally, through external triggers (e.g. incoming email or phone call), or internally, through thought processes and emotional states (e.g. remembering an important task). Interruptions occur in everyday work life and thereby influence employee behaviour and well-being (e.g. by increasing strain), as well as performance quantity (e.g. by decreasing work speed) and quality (e.g. by increasing error-rate) (Adler & Benbunan-Fich, 2015; Baethge & Rigotti, 2013; Brixey et al., 2007; Rigotti, Baethge, & Freude, 2012). For example, an employee who is working on a presentation might get distracted by a phone call from another client, asking about another project. After a 5-minute chat about the other project, the employee resumes working on the presentation.

The Brixey model of interruptions (Figure 1) describes interruptions as follows (Brixey et al., 2007). Before the interruption occurs, the individual is working on a primary task in the pre-interruption phase. Next, the interruption occurs and distracts the attention from the primary task towards the interrupting stimuli. The individual then needs to decide to accept the interruption or not. This period of time is the so-called interruption lag. When the individual accepts the interruption, he or she needs to handle the interruption. During this process, the cognitive resources needed for the primary tasks are on hold and occupied, while the interrupted individual needs to evaluate how to react towards the interruption. After handling the interruptions, the individual resumes the primary task with a resumption lag, that includes the preparation of the resumption of the primary task (e.g. needing more time to reallocate the next steps of the primary task). Then the post-interruption phase begins.

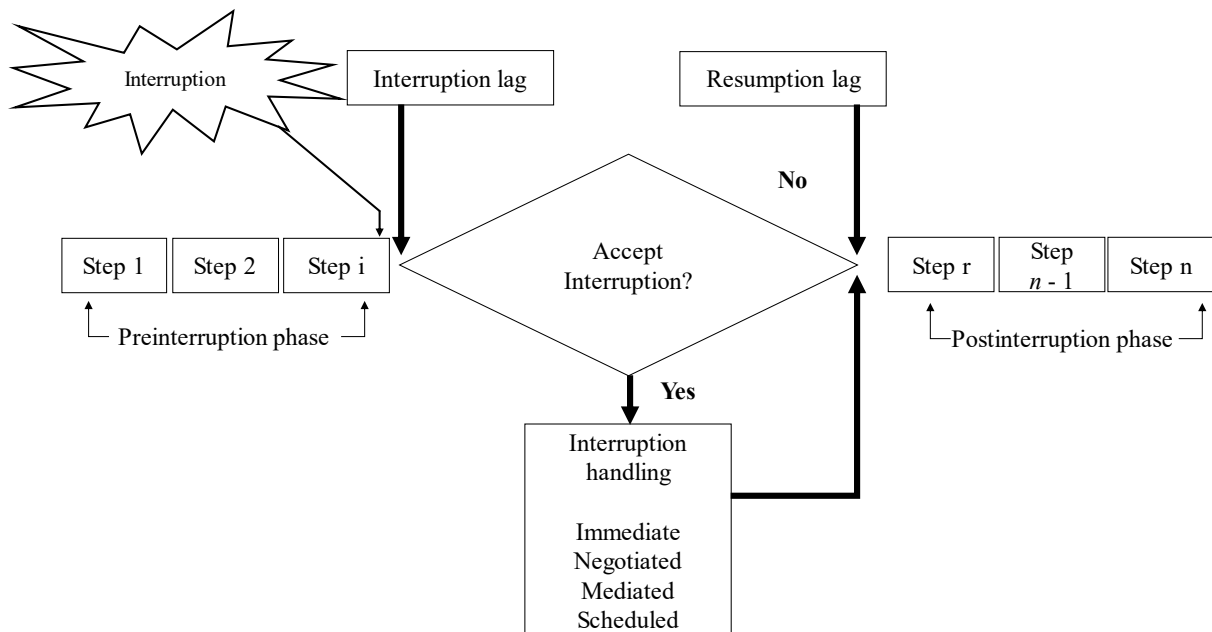


Figure 1. The Brixey Model of Interruption (Brixey et al., 2007)

The model helps to understand how interruptions in general affect work, and supports the assumption that interruptions can cause multitasking behaviour by inducing secondary tasks into the work schedule. Both, the interruption lag and the resumption lag use time resources and thus can increase time pressure at work and thereby induce stress (Baethge & Rigotti, 2013). When individuals experience interruptions and switch tasks as a result, additional time is required which is similar to so called switch costs (Salvucci, 2005).

It is crucial to differentiate between external and internal interruptions at this point. External interruptions oftentimes happen at unfortunate timepoints at work (e.g. when one is trying to concentrate on writing an email and the phone rings), distract the interrupted individual from the primary task and thus, negatively impact work progress and induce feelings of stress (Jett & George, 2003). Thus, external interruptions can be seen as stressors at work, that increase work demands (Baethge & Rigotti, 2013). Conversely, internal interruptions are at least to some degree under the control of the individual, as they are independent of external stimuli (Jett & George, 2003). Because the individual can decide when to interrupt themselves (e.g. when to make that urgent call that they just remembered), internal interruptions are less

likely to occur in such critical moments as external interruption and thus do not result in the same amount of stress (Jin & Dabbish, 2009). Based on this important differentiation between external and internal interruptions, research cannot generalize findings on the effects of external interruptions to internal interruption research.

Besides external interruptions, internal interruptions also show similar patterns with other phenomena, such as task switching in general, mind wandering and procrastination (Table 1). For example, internal interruptions can cause task switching behaviour and thus result in multitasking, but not every task switch results out of an internal interruption (Adler & Benbunan-Fich, 2013; Jett & George, 2003; Zimmer & Rigotti, 2015). Moreover, internal interruptions are defined by a change of task focus prior to the completion of the primary task, whereas task switching also includes switching from one task to another independent of its level of completion (Adler & Benbunan-Fich, 2013; Jin & Dabbish, 2009).

Table 1 Differences and Similarities between Interruptions and related Concepts

	Internal Interruption	External Interruption	Task Switching	Mind Wandering	Procrastination
External vs. Internal Trigger	Internal	External	Both	Internal	Both
Change of focus prior to completion	Yes	Yes	Not Necessarily	Not Necessarily	Not Necessarily
Plan to Resume Primary Task	Yes	Yes	Yes	Not Necessarily	Not Necessarily
Involves Secondary Task	Yes	Yes	Yes	No	Not Necessarily

Another example is mind wandering, which is defined as an attention shift away from the primary task towards thoughts that results in non-attendance of external stimuli (Dane, 2018). Internal interruptions are similar to mind wandering in that they also entail an attention

shift away from a primary task. However, internal interruptions differ from mind wandering in that they do not come with the same loss of attention for ones' environment as mind wandering (Smallwood, 2013). Furthermore, mind wandering does not involve a secondary task (e.g. writing an email or closing the window). Mind wandering might lead employees to start working on a secondary task (Dane, 2018), but this is not necessarily the case whereas to act upon a secondary task is one defining characteristic of internal interruptions (Jett & George, 2003; Jin & Dabbish, 2009; Speier, Vessey, & Valacich, 2003). Procrastination, a third conceptually related phenomena, describes the process of postponing a primary task, it includes the delay of beginning to act on a primary task as well as the completion of this action (Steel, 2007). Whereas internal interruptions only include the process of stopping the work on a primary task to resume the task after completing a secondary task, procrastination is not necessarily linked to the resumption of the primary task (Steel, 2007). Moreover, procrastination is defined as harmful behaviour, but internal interruptions are not (Baethge & Rigotti, 2010; Steel, 2007). This dissertation proposes that if people tend to interrupt themselves in order to delay the continuation of a primary task, internal interruptions can be used as procrastination strategy, but this is not a defining characteristic of internal interruptions (Adler & Benbunan-Fich, 2013). Thus, it is indeed valuable to consider internal interruptions as independent concept and investigate its antecedents and effects at work which would likewise help to differentiate better between internal interruptions and related concepts.

1.1.1 Effects of Interruptions

Another reason to differentiate between external and internal interruptions is delivered by their observed consequences. Research discovered that external interruptions show mostly negative effects on performance and well-being and explain these negative effects with additional regulative actions caused by the external interruptions (Baethge et al., 2015). On the one hand, external interruptions increase the time that is needed to accomplish both the

interrupted and the interruptive task, increase error-rates, cause higher workload, and decrease task performance overall (Adler & Benbunan-Fich, 2012; Bailey & Konstan, 2006; Jett & George, 2003; Mark, Gudith, & Klocke, 2008). On the other hand, external interruptions increase stress, induce anger, frustration, irritation, and anxiety and thereby negatively influence well-being (Baethge & Rigotti, 2015; Bailey & Konstan, 2006; Mark et al., 2008; Zijlstra, Roe, Leonora, & Krediet, 1999). However, some identify positive effects of interruptions on performance, especially when it comes to boring, easy, or creative tasks (Adler & Benbunan-Fich, 2015; Eyrolle & Cellier, 2000; Fisher, 1998; Jett & George, 2003). In these situations, interruptions can refresh the individuals thought processes and help to overcome cognitive fixation and thereby generate new/better ideas. One example is the unconscious thought theory, that describes that individuals come up with better creative solutions when they first set the task aside and do another unrelated task prior to their final decision (Dijksterhuis, 2004).

Research also provides some inconsistent evidence on the effects of internal interruptions, by identifying positive as well as negative effects (Adler & Benbunan-Fich, 2013; Jin & Dabbish, 2009; Katidioti, 2016). For one, internal interruptions that are linked to positive experiences result in improved performance (Adler & Benbunan-Fich, 2013). Differently, internal interruptions that are linked to negative experiences negatively influence task performance and internal interruptions in general reduce performance speed because employees need more time for decision making (Adler & Benbunan-Fich, 2013; Jin & Dabbish, 2009; Katidioti, Borst, van Vugt, & Taatgen, 2016). Moreover, research has not come to a consensus on the effects of internal interruptions because only few studies investigated internal interruptions thus far. Thus, it seems important to consider the reasons why people experience interruptions, and especially internal interruptions, to discover how interruptions influence our everyday work life.

1.1.2 Reasons for Internal Interruptions

The most apparent differentiation between external and internal interruptions lies within their causes. Whereas the reasons for external interruptions are easy to describe and observe (e.g. a fellow worker wants to shortly ask a question and stops by the office, or a clients' request is delivered via email), the reasons for internal interruptions are diverse and difficult to study (Adler & Benbunan-Fich, 2013; Baethge et al., 2015; Fisher, 1998). Nevertheless, previous research has discovered some reasons why individuals interrupt themselves in experimental or short observatory studies (Adler & Benbunan-Fich, 2013; Fisher, 1998; Jin & Dabbish, 2009). For one, individuals seem to interrupt themselves when they are bored, frustrated or unsatisfied at work (Adler & Benbunan-Fich, 2013; Fisher, 1998), but also when they feel like they need help from a colleague, need to seek information or are exhausted by their current task (Jin & Dabbish, 2009). Additionally, employees interrupt themselves because they feel the need to reorganize work, explore other possibilities or to stimulate their minds (Adler & Benbunan-Fich, 2013). Some of the named reasons can be connected to the availability of personal resources. Interruptions seem to occur when people experience unsatisfying emotional states which are associated with resource loss in the Conservation of Resources Theory (COR) (Hobfoll, 1989, 2002, 2011; Hobfoll, Halbesleben, Neveu, & Westman, 2018). For example, individuals interrupt themselves when they are bored or frustrated, and personal resources such as human energy are low. Because of the link between personal resources and the reasons for internal interruptions (e.g. feeling bored/exhausted is associated with low levels of energy), I will integrate human energy as personal resource into the internal interruption research, which is identified as one of the most important resources by Hobfoll (2002).

1.2 Human Energy in the Context of Internal Interruptions

Because so far, mainly affective reasons for internal interruptions have been discovered in experimental research, it is a logical consequence to interpret affective states as relevant for

internal interruptions at work. Thus, human energy, an affective state and important resource within the COR (Hobfoll, 2002), should be relevant for internal interruptions at work. Research identifies human energy as an activated experience, a state of feeling energized, vital, and invigorated, and meanwhile highlights activation as main aspect of this affective state (Quinn, Spreitzer, & Lam, 2012). Experiencing human energy incorporates that a person feels capable to achieve goals, work on a task and expand effort (Hobfoll, 1989; Quinn et al., 2012). Thus, having energy is unlikely to result in boredom or frustration at work and consequently should prevent internal interruptions. However, research has not focused on this connection up until now. To better understand the relationship between human energy and internal interruptions, it is important to expand the knowledge on human energy and its relations to work in general. This knowledge is relevant, as current research on human energy fails to establish a comprehensive understanding of the concept, and uses several similar concepts and measures (e.g. vigor (Schaufeli, Bakker, & Salanova, 2006; Shirom, 2011), subjective vitality (Ryan & Frederick, 1997), or positive activation (Thayer, 1986)) without aggregating their findings. Combined, this makes it difficult to integrate earlier findings in current research and neglects the need for parsimony in research.

One possible approach towards the connection between human energy and internal interruption is through the Conservation of Resources Theory (COR) by Hobfoll (2002). Hobfoll (2002) identifies human energy as a major personal resource in the COR. The COR suggests that stress increases when resources are threatened, scarce or exhausted. Basically, resources protect the individual from stress and help to cope with existing stressors. Moreover, exhausted resources can be protected and fostered by the presence of other resources. Resources can either be volatile or more stable over time. Human energy, itself, is a rather volatile resource that varies over the course of a work day (Ten Brummelhuis & Bakker, 2012). When the level of energy decreases, individuals try to protect the resources and try to find strategies to improve it, as based on the COR individuals strive for protecting and increasing resources (Hobfoll,

2002, 2011; Hobfoll et al., 2018). Thus, when energy decreases, individuals seek strategies to preserve the resource and use so called energy management strategies (EMS) at work (e.g. taking a break, or setting a new goal) (Fritz, Lam, & Spreitzer, 2011; Zacher, Brailsford, & Parker, 2014). Thus, internal interruptions that occur when individuals are bored or frustrated can be strategically used as EMS and thereby protect personal resources at work. For example, when a task is momentarily boring and the individual's energy is depleted, they might start working on a more engaging task and switch back to the boring task after regaining energy.

To investigate if this mechanism is a possible explanation for the underlying processes of internal interruptions and how they affect work, I first generated a consensus on human energy at work and provided knowledge about its relation to work-related concepts in general. Second, I investigated the reasons for internal interruptions in a context close to real work and expanded experimental knowledge in an external valid environment. Third, I investigated if we can observe the strategic use of internal interruptions as energy management strategies in a real-work setting and examined causality in this context. Finally, I expanded current knowledge on the effects of internal interruptions on performance, building on a theoretical framework. All in all, I considered internal interruptions with its antecedents and consequences as a complex work phenomenon in this dissertation.

1.3 Purpose of the Dissertation and Research Questions

Taken together, the general objective of this dissertation is to examine the underlying processes of internal interruptions at work and their antecedents and consequences. In particular this means first clearing up a proposed jangle fallacy (a situation in which similar concepts are labelled differently (Allen, Cho, & Meier, 2014)) of human energy. Second, identifying it as a potential precondition that prevents internal interruptions, discovering reasons for internal interruptions, and if internal interruptions can be used as energy management strategy. And

third, examining how internal interruptions affect performance compared to uninterrupted or externally interrupted work.

The presented studies contribute to the existing research in several ways. First, it contributes to multitasking research by differentiating between internal and external interruptions and providing insights into underlying processes that help to understand why and how interruptions can lead to multitasking behaviour. Moreover, I show that internal interruptions should be appraised differently than external interruptions and thereby open new perspectives for research on task switching and multitasking. Second, this dissertation highlights the importance of resources in the context of internal interruptions and thus connects two related and important research areas with one another, namely research on multitasking and research on resources. This connection is crucial to understand the processes beneath the surface and helps to elaborate knowledge beyond observable behaviour patterns. Third, it expands current knowledge on internal interruptions by investigating internal interruptions in an experimental as well as a real-work setting, thereby providing generalizable data and information on causal relations between human energy, internal interruptions and work performance. Figure 2 illustrates the overview of this dissertation.

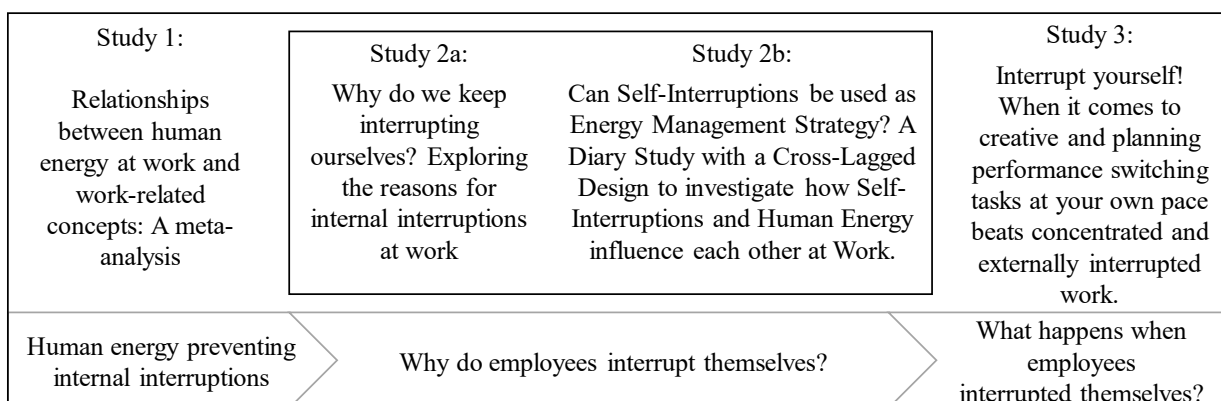


Figure 2. The Overview of this Dissertation

In summary, this dissertation addresses the following key questions:

- Does human energy suffer from a jangle fallacy, and what do we learn about human energy when we aggregate earlier findings? (Study 1)
- What reasons for internal interruptions can we observe in real work settings? (Study 2a/b)
- Can internal interruptions deal as energy management strategy and how is the relation between human energy and internal interruptions affected by other resources? (Study 2b)
- On which basis can we differentiate between internal and external interruptions, and does this differentiation influence how we perceive multitasking in general? (Study 3)

This dissertation first summarizes the state of knowledge about human energy and indicates human energy as an important component in the internal interruption framework. Second, the studies identify human energy among other antecedents of internal interruptions and thus provide knowledge about why people interrupt themselves at work, in a real work setting. Moreover, the studies try to discover a strategic use of internal interruptions as a new perspective on the interruption framework. Third, this dissertation investigates the effects of internal interruptions at work and compares them to external interruptions. Taken together this thesis provides new insights into the internal interruption framework and establishes a theoretical perspective on the antecedents and effects of internal interruptions in everyday work life.

1.4 Summary of the Research Papers Compiled in the Dissertation

1.4.1 Study 1: Relationships between Human Energy at Work and Work-Related Concepts: A Meta-Analysis

The overall goal of the meta-analysis is to provide a nomological network of human energy (e.g. vigour, vitality, and activation) at work. Another major objective of this study is to determine if diverse concepts of human energy as assessed with different measures show similar

relationships with work-related antecedents and outcomes to shed light on the jangle fallacy in human energy research. We collected 156 studies, resulting in a total of 262 independent samples ($N = 127,837$). We found not only positive relationships between human energy and positively connoted work-related concepts, such as job and organisational characteristics, job performance, and affective-motivational factors, but also negative relationships between human energy and negatively connoted work-related concepts, such as job stressors, negative work-related behaviour and cognition, and negative well-being outcomes. There was no evidence for a moderating influence on the relationships between human energy, and its antecedents and outcomes. Accordingly, the reported relationships do not differ for the different types and measurements of human energy and support the assumption of the jangle fallacy in human energy research. Based on our findings, we critically discuss the informative value of different human energy concepts and the corresponding jangle fallacy.

1.4.2 Study 2a: Why do we keep Interrupting Ourselves? Exploring the Reasons for Internal Interruptions at Work

Today, employees struggle with multiple work demands often occurring simultaneously and resulting in interruptions at work, which frequently affects work performance and employee well-being. Especially the reasons for internal interruptions, a self-started change of focus, remain mostly unknown but seem to be relevant when it comes to self-regulative behaviour. Based on the Conservation of Resources Theory and the Self-Regulation Theory this study provides a theoretical framework on affective and situational antecedents of internal interruptions. Using the critical incident technique in a cross-sectional design, 151 employees reported either a situation in which they interrupted themselves or a situation in which they engaged in focused work, as well as their current affective state and situational characteristics. The results support our assumption that employees tend to interrupt themselves more often when they experience low levels of energy, when they are bored or overstrained, and when situations are associated with a social character. Whereas employees tend to engage in focused

work when situations are dutiful and intellectually stimulating. Based on the theoretical framework, I conclude that internal interruptions can be used as energy management strategies when employees are confronted with straining tasks and thus help the process of resource replenishment and overall goal achievement.

1.4.3 Study 2b: Can Self-Interruptions be used as an Energy Management Strategy? A Diary Study with a Cross-Lagged Design to investigate how Self-Interruptions and Human Energy influence each other at Work.

In this study, we examined the underlying processes of internal interruptions at work. We propose that employees use internal interruptions strategically to manage their energy expenditure. Based on the Conservation of Resources theory, we expected that low levels of energy would lead towards internal interruptions to protect the energy resource. Furthermore, when job autonomy as a job resource is high, individuals are expected to use internal interruptions more successfully as an energy management strategy because they have the freedom to structure their work according to their needs. Using a daily-diary approach, we collected data from 161 employees, twice a day, on five consecutive work days. Multilevel modelling showed no cross-lagged effects between internal interruptions and human energy, thus not supporting our assumption of a direct relationship across the day. We observed a relationship between the key constructs when measured at the same time, hinting towards a short-term relationship. Moreover, job autonomy did not show the expected moderating effect. However, having high job autonomy increased internal interruptions when human energy was low. Last, exploratory analysis provided information on the reasons and intentions of internal interruptions. All in all, we concluded that internal interruptions only deal as an energy management strategy under specific circumstances and are not generally used to manage energy expenditure.

1.4.4 Study 3: Interrupt Yourself! When it comes to Creative and Planning Performance Switching Tasks at your own Pace beats Concentrated and Externally Interrupted Work

Employees experience frequent external and internal interruptions during work hours. Based on Action-Regulation Theory and research on energy management and task autonomy, we proposed a different impact of both types of interruptions on performance. We expected an internal interruption to consistently improve performance, and an external interruption to improve creative, but impair planning, performance. We also examined if interruptions affect energy levels and perceived autonomy to gain insight into the underlying process. To investigate our hypotheses, we conducted two laboratory experiments with a 1x3 design with a creative task (N=137) and a planning task (N=223). Contrast analysis revealed that the internal interruption affected performance positively in both tasks. However, effects of external interruptions varied. Moreover, we conclude that interruptions affect performance through a process based on perceived task autonomy. Overall, our research emphasizes the importance of distinguishing between external and internal interruptions in future studies as they differently affect various outcomes.

In sum, the four studies contribute to a better understanding of multitasking in our daily work life. They especially develop the understanding of internal interruptions at work, which is one relevant aspect of multitasking and shows to be relevant at everyday work life. Parts of the studies in this dissertation were conducted in close collaboration with co-authors (for more details regarding the specific contribution in each study see Conference Contributions and Scope of Responsibility). In order to avoid inconsistencies in style due to different personal pronouns, the plural will be used throughout the four studies of this dissertation.

2 Study 1: Relationships between Human Energy at Work and Work-Related Concepts: A Meta-Analysis

2.1 Introduction

Human energy is crucial for human functioning at work, which is why practitioners and researchers in organisational psychology show increasing interest in this concept (Cole, Bruch, & Vogel, 2012; Quinn et al., 2012; Schwartz & McCarthy, 2007; Shirom, 2011). Based on the definition by Quinn et al. (2012), human energy is a state of energetic activation, which is represented in mood states, or emotions. There are numerous concepts “in the literature that all refer to human energy such as “energetic arousal (Thayer, 1989), positive activation (Watson, Wiese, Vaidya, & Tellegen 1988), subjective vitality (Ryan & Frederick, 1997), emotional energy (Collins, 1993), subjective energy (Marks, 1977), and zest (Miller & Stiver, 1997).”” (Quinn et al., 2012, p. 6).

Scholars also define human energy as a state of invigouration, the experience of vitality, and the perceived mental ability to deal with challenges (Ryan & Frederick, 1997; Schaufeli, 2012; Shirom, 2003). These concepts commonly describe human energy as an activated affect (Quinn & Dutton, 2005; Ryan & Frederick, 1997; Shirom, 2003), but not all of them emphasize its positive valence (Daniels, 2000; Thayer, 1986; Watson, Wiese, Vaidya, & Tellegen, 1999). Taken together, all these concepts seem to be closely conceptually related (Quinn et al., 2012; Schaufeli, 2012), potentially resulting in a jangle fallacy, “a situation in which two things that are the same or nearly the same are labeled differently” (Allen et al., 2014, p. 103). This construct proliferation is a major problem in organisational psychology research because ignoring the request for parsimony creates misunderstandings, and restricts systematic research advancement (Cole, Walter, Bedeian, & O’Boyle, 2012; Le, Schmidt, Harter, & Lauver, 2010).

The objective of this study is twofold. First, we aim to establish a nomological network of human energy by means of a systematic review. In particular, we investigate relationships between human energy, and various work-related antecedents (e.g., job and organisational resources and stressors) and outcomes (e.g., well-being, job performance, turnover intention) (Figure 3). Second, we allude to the notion of construct proliferation, and investigate whether the different concepts of human energy show similar patterns of relationship with work-related concepts. In summary, our study seeks to advance our knowledge of how human energy relates to individual and organisational work-related concepts, and it aims to shed light on the jangle fallacy by exploring differential relationships among the human energy measures, thus contributing to a consensus on different human energy concepts.

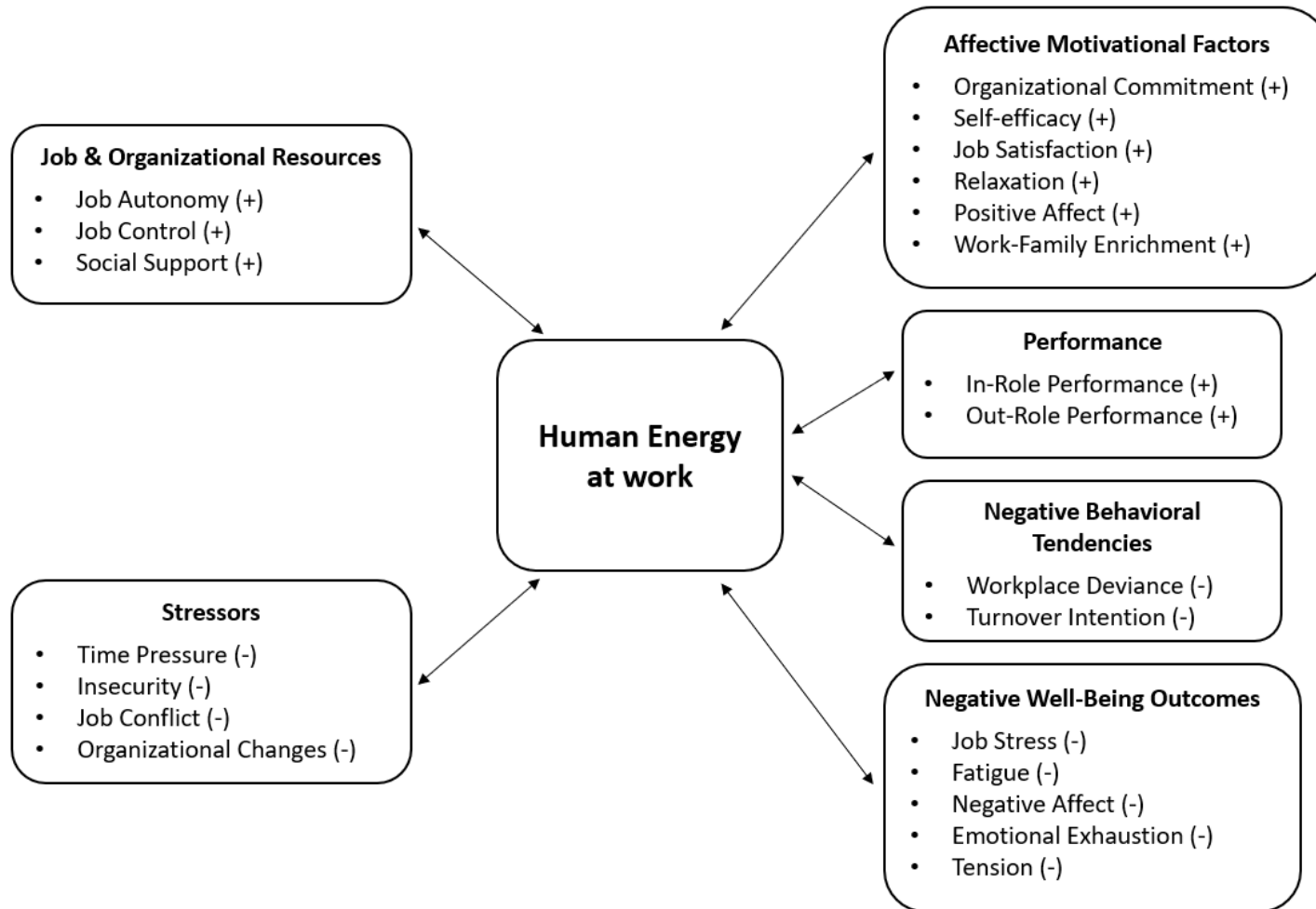


Figure 3. Conceptual Model and Nomological Network of Assumed Antecedents and Outcomes of Human Energy at Work

Note. Within parentheses, (+) indicates generally positive relation to human energy noted in literature, (-) indicates generally negative relation to human energy noted in literature. Double-headed arrows indicate correlational relationships rather than causal relationships.

2.2 Human Energy: Conceptualization and Theoretical Background

Historically, human energy is embedded in different theoretical models. Some of them view energy as a scarce resource (Freud, 1961), while others view energy as abundant (Durkheim, 1954). Both approaches are supported by recent research (Quinn et al., 2012). Scholars identify human energy as an activated experience, as a state of feeling energized, vital, and invigorated, and highlight activation as main characteristic (Quinn et al., 2012; Shirom, 2003; Thayer, 1986; Watson et al., 1999). However, scholars disagree on the degree to which energy is positive in its valence. While some researchers claim that feeling energized is a positive state (Quinn et al., 2012; Shirom, 2011), others argue that it is valence-free, or can be distinguished from other positive aroused states such as enthusiasm (Daniels, 2000).

Human energy as an activated affective experience can be described as a personal and volatile resource that varies across time (Ten Brummelhuis & Bakker, 2012). Resources are defined as individual characteristics, objects, conditions, states, or energies which are valuable for individuals and enable humans to act (Hobfoll, 1989). Human energy can be invested in activities related to the pursuit of work goals, but whether or not this is done depends on whether a person feels committed to the respective work goal or not (Quinn et al., 2012). Former research further elaborates that human energy represents more of an essential precondition for motivation and effort than an executive force (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Seo, Barrett, & Bartunek, 2004). Altogether, within this study, human energy is defined as an activated affective state which can enable humans to motivate themselves, and act and react to different demands.

2.2.1 The Human Energy Concepts - Vigour, Subjective Vitality, and Energetic Activation

In the following, we focus on the two energy concepts of vigour (Schaufeli, Salanova, González-Romá, & Bakker, 2002; Shirom, 2003), subjective vitality (Ryan & Frederick, 1997), which are frequently examined in the organisational psychology literature and provide

sufficient empirical studies to be meta-analytically analysed in detail¹ (Bhave & Leftner, 2017; Mackey, Perrewé, & McAllister, 2017). *Vigour* is described by Shirom (2003) as a positive affective experience that occurs due to a personally meaningful interaction at work in the form of physical strength, emotional energy, and cognitive liveliness (Shirom, 2003). He understands vigour as a core affect located within the circumplex model of affect (Russell (2003) which additionally includes motivational elements and resilience to adverse circumstances. Based on this understanding of vigour, Shirom developed the Shirom-Melamed Vigour Measure (SMVM) (Shirom, 2003), which focuses on the affective experience of vigour. Schaufeli (2012) conceptualizes vigour as one dimension of work engagement which is characterized “*by high levels of energy and mental resilience while working, the willingness to invest effort in one’s work, and the persistence even in the face of difficulties.*” (Schaufeli, 2012, p. 4). Both definitions emphasize the role of activation and mental resilience for vigour; Schaufeli (2012) however, sees vigour as a component of work engagement, and includes a motivational-behavioural perspective of persistence, while Shirom (2003) reports a positive relationship to work engagement in his review, treating them as separate entities. Taken together, vigour is proposed to be a positive activated state, incorporating valence in its definition.

Subjective vitality is described by Ryan and Frederick (1997) as an experience of invigoration, energy, and aliveness (Ryan & Frederick, 1997). Grounded in self-determination theory, Ryan and Frederick (1997) understand subjective vitality as an indicator of physiological and psychological well-being. Similarly to vigour, subjective vitality is described as a positive state (Ryan & Frederick, 1997). Subjective vitality was first applied in clinical studies as well as in studies on the well-being of elderly people (Kasser & Ryan, 1999). Other scholars underline the importance of subjective vitality to organisational psychology research

¹ Zest (Miller and Stiver (1997), productive energy (Cole et al. (2012) professional vitality (Baruch, Grimland, and Vigoda-Gadot (2014); Harvey (2002) are included in the analyses on establishing the nomological net of human energy, but are not introduced and explained in detail because these concepts are less well represented in the literature on human energy at work.

(Baruch et al., 2014; Schmitt, Belschak, & Den Hartog, 2017). Schmitt et al. (2017) for example, show a direct link to outcomes such as proactive behaviour.

In addition to these frequently examined concepts, the concept of *energetic activation* as introduced by Thayer (1986) is important to consider. Thayer develops a two-dimensional model of mood, including the dimensions of energy and tension, differentiating between energetic activation and tense activation (Thayer, 1986). Thayer defines energetic activation (also called energetic arousal) as the experience of energy, vigour, or pep (Thayer, 1986). Unlike vigour and vitality, Thayer (1986) sees human energy as energetic activation and as a valence-free concept. The activation-deactivation checklist as well as other constructs (e.g., job-related affective well-being; van Katwyk, Fox, Spector, & Kelloway, 2000) are based on Thayer's work and used in organisational research (Ohly, Göritz, & Schmitt, 2017).

2.2.1.1 Operationalizing the Concepts of Human Energy.

Based on the different conceptualizations in the literature, there are various instruments operationalizing human energy. These instruments include example items such as “I feel alive and vital”, and “I feel energised” (subjective vitality scale, Ryan & Frederick, 1997); “I feel energetic” and “Feeling of vitality” (Shirom-Melamed Vigour measure (SMVM), Shirom, 2003); “At my work, I feel bursting with energy.” and “At my job, I feel strong and vigorous” (Vigour subscale of the Utrecht Work Engagement scale (UWES), Schaufeli et al., 2006), and feeling “alive” and “vital” as some of the single items from the ADAFL by Thayer (1986). Despite some different nuances in some of the items, it becomes obvious that these measures of human energy partly overlap in item content. A few of the measures are closely related to the assessment of general positive affect, which highlights the similarities between some of the human energy concepts and positive affect. Thus, based on most of its measures, human energy is a rather positive state, whereas the theoretical conceptualizations do not necessarily lead to this assumption (Quinn & Dutton, 2005). We do not know, however if these different scales capture the same overall concept despite being labelled differently or if they tap into different

concepts of human energy. Moreover, it is unclear whether or not relationships between human energy, and work-related antecedents and outcomes, differ if different measures are used.

2.2.2 Theoretical Framework

Multiple theories on human energy build on different resource-based and self-regulation models. According to the Conservation of Resources Theory (COR) by Hobfoll (2002), energy is seen as a resource. The COR theory holds that humans thrive to maintain and increase resources such as human energy whilst facing the threat of resource-loss, the occurrence of a loss of resources and the lack of resources (Hobfoll, 2002; Hobfoll et al., 2018). Having resources can foster human energy (Quinn et al., 2012) and consequently result in resource gain as well as lower stress, whereas dealing with job demands can result in stress, as they reduce energy and thereby result in a resource-loss (Quinn et al., 2012; Ten Brummelhuis & Bakker, 2012). Furthermore, the COR theory predicts that energy enables employees to cope better and show resilience throughout a work day (Ten Brummelhuis & Bakker, 2012), which again should result in less stress. The broaden-and-build theory (Fredrickson, 2001) proposes that positive emotions in general may broaden the scope of attention and cognition and thereby help to sustain other personal resources. Personal resources, in turn, result in enhanced health and well-being (Fredrickson, 2001). This process describes an upward spiral which supports positive effects of positive emotions and resources. Connecting the COR theory, the broaden-and-build theory, and the energetic activation framework (Thayer, 1986), one might propose that human energy, as an activated state and resource, can increase other resources which reciprocally enhance positive emotions as described within the upward spiral.

According to the self-determination theory (SDT) (Ryan & Deci, 2000), the three fundamental human needs of competence, relatedness, and autonomy can be differentiated and affect self-motivation, social functioning, and personal well-being (Deci & Ryan, 2008). Individuals aim to experience the fulfilment of these three needs to increase human energy,

which further promotes motivation and well-being. Finally, self-regulation theories are relevant for understanding human energy at work (Roe, 1999). According to Roe (1999), performance, for example, requires the utilization of individuals' cognitive, physical, and energetic resources. Self-regulatory processes influence goal achievement and can further be linked to well-being (Baumeister & Vohs, 2007). Taken together, in self-regulation theory, self-regulatory processes are oriented to protect and foster energy, which again helps to achieve goals (Baumeister & Vohs, 2007; Roe, 1999; Seo et al., 2004).

2.2.3 Work-Related Concepts and their Relationships to Human Energy

To establish a nomological network of human energy at work, we focus on frequently examined concepts in the literature on organisational psychology. We present directional relationships between human energy and work-related concepts within our model following previous research (Carmeli, Ben-Hador, Waldman, & Rupp, 2009; Carmeli, McKay, & Kaufman, 2014; Shirom, 2003) the practice of other meta-analyses in this field (Bennett, Bakker, & Field, 2018; Moghimi, Zacher, Scheibe, & van Yperen, 2017) but do not neglect the possibility of reciprocal relationships. We cluster the concepts into the following antecedents: job and organisational resources, job stressors and outcomes: affective-motivational factors, performance, negative well-being outcomes and negative behavioural and cognitive outcomes. This is based on several theoretical arguments which will be presented within the next section. Additionally, we find support for our hypothesizing in Halbesleben (2010) who meta-analytically examined work engagement, which is partly defined by human energy by the dimension of vigour. Figure 3 represents a conceptual model and displays the expected relations.

2.2.3.1 Relationships between Human Energy and Antecedents.

Job and organisational resources refer to the characteristics of the occupation or the organisation that are valued by employees and help them to pursue their work goals. Job

autonomy, as one example of this cluster, is described as the experience of employees to be able to act autonomously and independently on their own tasks (Hackman & Oldham, 1975). Based on the COR theory and SDT, we expect a positive relation between job and organisational resources and human energy at work. Moreover, we expect the relationship to be directional, as the energetic experience of an employee is less likely to change given organisational characteristics. For example, employees who have the freedom to structure and do their work independently, or who experience social support are likely to experience energy as a result (Hobfoll et al., 2018). This assumption is supported by Halbesleben (2010) who found a positive relationship between work engagement (with vigour being one key dimension) and organisational resources. Based on the COR theory and earlier findings (Cole et al., 2012; Halbesleben, 2010; Mauno, Kinnunen, & Ruokolainen, 2007), we hypothesize:

Hypothesis 1a: Human energy is positively related to job and organisational resources (i.e., autonomy, job control, social support, LMX).

Job stressors such as job insecurity, work pressure, and work conflict are described as having a negative impact on employees' health and well-being. Job insecurity reflects the way employees experience the certainty of keeping their job (Cheng, Mauno, & Lee, 2014). For example, a threat of job loss is associated with high levels of job insecurity (Cheng et al., 2014). We assume that employees who are concerned about a possible job loss are less likely to feel vital or invigorated at work. They rather experience negative affect and worries due to the uncertainties about their future (Coetzee & Villiers, 2010). Our assumption is in line with the SDT, since competence and relatedness are what is needed in order to create energy, however it is unlikely to be experienced during times of job insecurity or increased job stressors. Furthermore, it is in line with the COR, as job stressors including job insecurity (Cheng et al., 2014) do not support resource preservation but rather reduce the accessibility of resources, such as human energy at work (Halbesleben, 2010). Empirically, a variety of stressors are associated

with higher exhaustion, the opposite of human energy (LePine, Podsakoff, & LePine, 2005).

Based on these findings and arguments we propose:

Hypothesis 1b. Human energy is negatively related to job stressors (i.e., time pressure, conflict, and job insecurity).

2.2.3.2 Relationships between Human Energy and Positive Outcomes.

Affective-motivational factors are broadly defined as positively connoted personal factors such as positive affect, job satisfaction, and self-efficacy, which vary over time and affect organisational outcomes through employees' motivation (Parker, Bindl, & Strauss, 2010). We expect affective-motivational factors in general to be positively related to human energy. This assumption is grounded partly on the broaden-and-build theory (Fredrickson, 2001), as it predicts an upward spiral of positive states and human energy. One example in this cluster is the concept of self-efficacy which is defined as "*the conviction that one can successfully execute the behaviour required to produce the outcomes.*" (Bandura, 1977, p. 193). Thus, self-efficacy is crucial to successfully execute one's job tasks, and to achieve individual goals. Self-efficacy is supposed to be positively related to human energy at work (Shirom, 2003). In other words, when humans experience high levels of energy, they are more likely to feel efficacious and vice versa, which is in line with the upward spiral in the broaden-and-build theory as well as the COR theory. As experiencing energy fosters self-efficacy beliefs, it adds up to ones' positive experience of successfully processing work and will further relate to employees' well-being. Additionally, scholars provided evidence for a positive link between human energy and efficacy beliefs (Ryan & Frederick, 1997; Schaufeli, 2012; Shirom, 2003). Other affective-motivational factors, such as motivation, organisational commitment, job satisfaction, well-being, positive affect, and detachment from work were also examined in relation to human energy (Hobfoll, 2002; Sonnentag, Binnewies, & Mojza, 2008).

Hypothesis 2a. Human energy is positively related to affective-motivational factors (i.e., self-efficacy, organisational commitment, job satisfaction, positive affect, psychological well-being, detachment from work, and work-family enrichment).

Job performance can be differentiated into in-role and extra-role performance dimensions (Bakker, Demerouti, & Verbeke, 2004; Borman & Motowidlo, 1993). In-role performance is defined as the outcomes and behaviours of employees which are linked to personal success and goal achievement (Bakker et al., 2004). Hence, in-role performance directly serves to meet organisational objectives and, for example, includes one's job expertise (Goodman & Svyantek, 1999). Extra-role performance refers to performance which is not directly linked to employees' target productivity, but still promotes organisational success (Posdakoff & MacKenzie, 1994). An example for extra-role performance is organisational citizenship behaviour, which includes helping colleagues with heavy workloads (Posdakoff & MacKenzie, 1994). Based on Fredrickson's (2001) approach, feeling energetic may promote action and problem-solving by broadening the range of perspectives, and might therefore support job performance through goal achievement (Shirom, 2003). Moreover, achieving goals fosters positive emotions which thereby might increase human energy (Shirom, 2003). Thus, the relationship between job performance and human energy might be reciprocal, as described by the upward spiral in the broaden-and-build theory. Supporting this view, scholars reported positive relations between vigor/vitality and job performance (Carmeli et al., 2009; Halbesleben, 2010; Reijseger, Peeters, Taris, & Schaufeli, 2016). A similar finding was reported by Halbesleben (2010), supporting a positive relationship between work engagement and job performance. Based on these assumptions we propose:

Hypothesis 2b. Human energy is positively related to job performance, including in-role, and extra-role performance.

2.2.3.3 Relationships between Energy and Negative Outcomes.

Negative well-being outcomes summarize outcomes that negatively influence well-being such as negative affect and emotional exhaustion. As one example, we will introduce exhaustion and its relation to human energy in detail. Emotional exhaustion is a component of burnout and is defined as “a consequence of intensive physical, affective and cognitive strain [...]” (Demerouti, Mostert, & Bakker, 2010, p. 210). Schaufeli (2012) proposes that exhaustion is the opposite of energy, as it comprises the feeling of being “drained” or “without energy”. Quinn et al. (2012) state that emotional exhaustion is not only characterized by a low level of energy, but also by the sense of the inability to recapture a state of high energy. Furthermore, exhaustion is defined as the experience of emotional overload and the feeling of being drained (Quinn et al., 2012). Further concepts, which can similarly lead to exhaustion, include negative affect, job stress, fatigue, and tension. We expect them to be negatively related to human energy because employees who have access to resources, such as energy, are less likely to feel stressed, as they are able to cope better (Hobfoll et al., 2018). Accordingly, job stress derives from the threat of resource loss or the lack of resources as described by the COR (Hobfoll, 1989), and thus the lack of energy should result in negative well-being outcomes. Additionally, the experience of human energy is unlikely to occur simultaneously to the feeling of being drained. Our assumptions are empirically supported by many scholars (e.g., Cheng et al., 2014; Demerouti, Bakker, Sonnentag, & Fullagar, 2012; Halbesleben, 2010), and we thus hypothesize:

Hypothesis 3a. Human energy is negatively related to negative well-being outcomes (e.g. exhaustion, fatigue, negative affect, and tension).

Negative work-related behavioural tendencies capture concepts which result in or imply behavioural tendencies and negatively affect organisations (e.g. turnover intention, deviance and avoidance). As an example for this cluster, turnover intention describes a behavioural tendency to leave the organisation and the willingness to seek alternative employment (Tett &

Meyer, 1993). In line with earlier research findings (Mills, Culbertson, & Fullagar, 2011), we expect that employees who experience a drive for their work, and thereby feel invigorated and energetic, will less likely be thinking about leaving their job and their organisation. Similarly, Halbesleben (2010) provides evidence for work engagement being negatively related to turnover intention. Thus, we expect a negative relationship between turnover intentions and human energy. Altogether, we propose:

Hypothesis 3b. Human energy is negatively related to negative work-related behavioural tendencies, including turnover intentions, deviance, counterproductive work behaviour.

2.2.4 Human Energy Measures as Boundary Conditions

We integrate different human energy measures into our research because different human energy concepts might describe the same phenomenon representing a jangle fallacy. A jangle fallacy describes “a situation in which two things that are the same or nearly the same are labelled differently” (Allen et al., 2014, p. 103). We assume that a jangle fallacy exists because of theoretical and conceptual similarities that become present when comparing the different concepts (Quinn et al., 2012), and similar findings in previous research on each of the concepts (Lei, Kaplan, Dye, & Wong, 2018; Mauno & Ruokolainen, 2017; Stillman et al., 2010). This is also in line with Quinn et al. (2012), who highlight the conceptual and empirical overlap of the human energy concepts. Yet, the concepts slightly differ from one another regarding their degree of closeness to the organisational context. While vigour is developed within the scope of organisational research, vitality is not (Ryan & Frederick, 1997; Shirom, 2003). Moreover, the concepts of human energy differ in the degree to which they recognize positive valence as a defining feature of human energy. While some propose that energy is a positively activated affective state (Quinn et al., 2012; Schaufeli & Bakker, 2003; Shirom, 2003), others argue that human energy is a valence-free concept (Schmitt et al., 2017; Thayer, 1986; Watson et al., 1999) which can be distinguished from other highly positive states

(Daniels, 2000). Accordingly, the measurement of these concepts might differ. It is unclear if the different foci of these concepts affect the observed relations with antecedents and outcomes. Despite the fact that scholars report similar correlations among different human energy measures and work-related concepts (e.g., work performance), we assume that there are differences in the empirical findings on human energy at work based on their different conceptual underpinning and forms of operationalisation. To investigate a possible jangle fallacy in human energy research we hypothesize:

Hypothesis 4. The different measurements of human energy that capture and represent different concepts moderate the relationship between human energy and work-related concepts.

2.2.4.1 State versus Trait Perspective of Human Energy as Boundary Condition.

Besides the human energy measures, we suspect that whether human energy is measured as a trait or a state affects the relationships. In line with Ten Brummelhuis and Bakker (2012), we define human energy as a state and a volatile resource that may vary across time (e.g., during a work day), yet in some studies human energy is measured as a trait. Previous research suggests that the way variables are assessed, and how data is collected impacts the relationships between the antecedent and its outcome variables (e.g., D’Innocenzo, Mathieu, & Kukenberger, 2016; Meyer, Stanley, Herscovitch, & Topolnytsky, 2002). Hence, by integrating the way of measurement as a moderator, we may provide better insights into the nomological net of human energy.

2.3 Method

To test our hypotheses, we conducted a meta-analysis as proposed by Hunter and Schmidt (2004). We conducted a literature search in major academic databases such as Web of Science, PsycINFO, and Google Scholar and the university online library between September 2016 and May 2019. We used the following key words “energy/vigour/vitality at work”,

“energy/vigour/vitality and performance”, “energy/vigour/vitality and job satisfaction” as well as “energy/vigour/vitality and well-being at work”. Furthermore, we searched for articles citing Quinn et al. (2012), Cole et al. (2012), Ryan and Frederick (1997), Schaufeli et al. (2002), Thayer (1986), and Shirom (2003), and invited scholars through relevant scholarly associations to forward published or unpublished literature. The literature search resulted in more than 5000 articles, that were screened and judged according to the rules reported below.

First, we screened the article abstracts and excluded theoretical articles and reviews. Second, we screened the methods sections and excluded also those articles that did not examine the relationship of human energy and work-related concepts. Next, we applied the following rules. To be included in the final sample, the studies had to report information on correlations, sample size, construct reliability, standard deviation, measures used, study design, and the sample characteristics (Hunter & Schmidt, 2004). We included all studies published in English or German language that were available by May 2019. In cases where studies did not report all the required information, we contacted the authors asking to provide the data. This procedure yielded a total of 156 studies published between the years 2000 and May 2019 for further analysis².

The coding of the studies was done independently by the first author and two research assistants. The research assistants were unfamiliar with the hypotheses under investigation. Interrater agreement between the coders was calculated, and consensus was reached through discussion to ensure consistency within the coding process. As two-wave, as well as cross-sectional and diary studies were integrated into the analysis, the following rule for integrating the effect size was applied. For two-wave study designs, we always reported the correlation between energy at T1 and the work-related concepts at T2. For diary studies, we reported the correlations at the between-person level which are insensitive to within-person variability and

² A list of all included articles is displayed in Appendix 1

thus resemble the information that is given in cross-sectional studies (Bennett et al., 2018). When one article reported more than one study or sample, we coded the studies and samples separately. Moreover, we used the reported alpha from scale development papers when reliability coefficients were missing. In each cluster (see below), we conducted one meta-analysis and examined moderators. However, multiple effect sizes were coded if the effect sizes belonged to multiple clusters.

2.3.1 Work-Related Concept Clusters

As many work-related concepts were only examined in few empirical studies, we clustered these concepts a posteriori to be able to meta-analyse the coded data. We clustered the observed work-related concepts into six independent clusters. The concepts included within the clusters are used as moderators, to be able to explain variability within each relationship between the clusters and human energy. This approach enables us to give a comprehensive overview of the antecedents and outcomes of human energy, as it allows us to include concepts that are underrepresented in current research on human energy. Still, our study is bound to the relationships that have been investigated in former research (Bauer, Bodner, Erdogan, Truxillo, & Tucker, 2007; Kleine, Rudolph, & Zacher, 2019, in press) and thus, does not investigate all possible work-related concepts. Hunter and Schmidt (2004) recommend averaging across multiple effect sizes for the same study. However, we decided to include only effect size of the concept which reported a higher scale reliability. This is based on the perspective that single correlations, based on a certain concept, provide more information for the objective to identify the nomological network of a variable than cumulated correlations. Thus, there is a maximum of one effect size per sample in each analysis resulting in a non-dependence of the effect sizes included into each analysis. For example, only the effect size for autonomy (but not social support) was coded for resources examined in Xanthopoulou, Bakker, Demerouti, and Schaufeli (2007). This approach enables us to conduct moderator analyses for each cluster

which would not be feasible for cumulated (averaged) correlations. To support our inductive approach, interrater agreement on the cluster coding using Cohen's kappa was satisfying ($\kappa = .738$).

2.3.2 Meta-Analytic Analysis

First we used the R package psychmeta by Dahlke and Wiernik (2018) for analysis, according to Hunter and Schmidt (2004). We calculated a basic barebone analysis, and additionally corrected for artefact distribution as well as range restriction. Furthermore, we used the R package metafor by Viechtbauer (2010) to calculate meta regressions and conduct moderator analysis. Finally, we conducted sensitivity analysis to address publication bias using the weight models by Vevea and Hedges (1995) and cumulative meta-analysis by McDaniel (2009).

We calculated a random-effects model because it enables us to extend our results beyond the studies used for the meta-analysis and extend our findings to the total working population (Field, 2001). The package calculated mean effect sizes and the amount of heterogeneity based on the sample and the true variance. These parameters inform us about the variance explained with the help of our constructed model. To interpret the correlation estimates we followed Paterson, Harms, Steel, and Credé's (2016) recommendations for overall effects in organisational research with $\rho < .278$ being below and $\rho > .278$ above average. Hypotheses 1 to 3 would be supported if the following two conditions were met a) 95% confidence intervals around the mean correlation do not include zero and b) the population correlations (ρ) are in the expected direction. Moreover, an 80% credibility interval helps to identify whether or not additional moderators are likely.

2.4 Results

2.4.1 Hypotheses 1a – 1b

The results on the relationships between work-related antecedents and human energy (hypotheses 1a – 1b) are displayed in Tables 2 and 3. Table 2 shows a population correlation coefficient of .36 between human energy and job and organisational resources (e.g. autonomy and job fit), and thereby supports Hypothesis 1a. The results within the cluster differ slightly from each other with a maximum variation of $\Delta \rho = .10$, varying from $\rho = .40$ for autonomy and $\rho = .30$ for support. Human energy is negatively, but weakly, related to different stressors at work (e.g., $\rho = -.22$ for job insecurity and $\rho = -.22$ for job conflict) (Table 3), supporting Hypothesis 1b. In contrast to the other concepts included in the cluster on various work-related stressors, work pressure does not correlate significantly with human energy as the confidence interval includes zero. Accordingly, excluding work pressure increases the relationship between human energy and job stressors and decreases the study variance from .04 to .01.

Table 2

Meta-Analytic Correlations between Human Energy and Job and Organisational Resources Including Moderators

Analysis	Category	<i>k</i>	<i>N</i>	Observed ^a		Corrected ^b		80% <i>CV</i>	τ^2	<i>se</i>
				<i>r</i>	<i>se_r</i>	<i>r</i>	<i>se_r</i>			
Total		51	25587	.30	.02	.36	.02	[.18, .53]	.02	.01
Job and Organisational Resources	Autonomy	12	8319	.34	.03	.40	.03	[.27, .54]	.01	.01
	Job control	17	7388	.29	.03	.35	.03	[.18, .53]	.02	.01
	Social support	10	6591	.27	.03	.30	.04	[.15, .45]	.01	.01
	Others ^c	12	3289	.30	.06	.36	.07	[.03, .68]	.06	.03
Human energy measure	UWES ^d	40	23435	.29	.02	.34	.02	[.17, .50]	.02	.01
	Others ^c	11	2152	.48	.03	.55	.03	[.41, .69]	.01	.01
Trait vs. State	Trait	42	23061	.29	.02	.35	.02	[.17, .53]	.02	.01
	State	9	2526	.36	.03	.44	.04	[.31, .52]	.01	.01

Note. *k* = number of studies, *N* = total sample size, *r* = meta-correlation, *se_r* = standard error of correlation, *CV* = 80% credibility interval of estimate, τ^2 = variance indicator, *se* = error of variance of τ^2 . ^a bare bones analysis. ^b incl. correction for measurement error. ^c incl. organisational fit & LMX. ^d Vigour subscale of Utrecht Work Engagement Scale (Schaufeli & Bakker, 2003). ^e incl. Productive Energy (Cole et al., 2012).

Table 3
Meta-Analytical Correlations between Human Energy and Work-Related Stressors

Analysis	Category	<i>k</i>	<i>N</i>	Observed ^a		Corrected ^b		80% CV	τ^2	<i>se</i>
				<i>r</i>	<i>se_r</i>	<i>r</i>	<i>se_r</i>			
Total		29	17897	-.11	.03	-.12	.04	[-.37, .12]	.04	.01
Stressors	Time pressure	10	4961	.09	.06	.10	.07	[-.19, .39]	.05	.02
	Job insecurity	5	7164	-.20	.02	-.22	.03	[-.30, -.14]	.00	.00
	Job conflict	5	3435	-.18	.04	-.22	.06	[-.41, -.03]	.02	.01
	Organisational changes	4	1238	-.10	.03	-.12	.03	[-.12, -.12]	.00	.00
	Others ^c	5	1099	-.14	.05	-.17	.07	[-.36, .02]	.01	.01
Human energy measure	UWES ^d	23	13060	-.09	.04	-.11	.05	[-.40, .18]	.05	.02
	Others ^e	6	4837	-.14	.02	-.16	.02	[-.20, -.11]	.00	.00
Trait vs. State	Trait	23	16080	-.11	.04	-.13	.04	[-.39, .13]	.04	.02
	State	6	1817	-.07	.04	-.08	.05	[-.24, .07]	.01	.01

Note. *k* = number of studies, *N* = total sample size, *r* = meta-correlation, *se_r* = standard error of correlation, CV = 80% credibility interval of estimate, τ^2 = variance indicator, *se* = error of variance of τ^2 . ^a bare bones analysis. ^b incl. correction for measurement error. ^c incl. overload, workplace bullying & hindrance stressors. ^d Vigour subscale of Utrecht Work Engagement Scale (Schaufeli & Bakker, 2003). ^e incl. Productive Energy (Cole et al., 2012).

2.4.2 Hypotheses 2a – 2b

Our results show that human energy is positively related to positive consequences of work. Hypothesis 2a is supported as the true correlation estimate for human energy and affective-motivational factors is $\rho > .46$ (Table 4). Hypothesis 2b is supported by a moderate positive correlation between energy and performance ($\rho = .38$) (Table 5). Comparing the results of the dependent variables within the clusters shows that there are some differences among the results for different variables integrated into this cluster. Those differences are mostly small and are displayed with a maximum difference of the estimate population correlation of .10 for

affective-motivational factors and performance to human energy. Furthermore, positive affect is strongly related to human energy ($\rho = .55$).

Table 4

Meta-Analytic Correlations between Human Energy and Affective-motivational Factors

Analysis	Category	<i>k</i>	<i>N</i>	Observed ^a		Corrected ^b		80% <i>CV</i>	τ^2	<i>se</i>
				<i>r</i>	<i>se_r</i>	<i>r</i>	<i>se_r</i>			
Total		79	42575	.47	.02	.56	.02	[.34, .77]	.03	.01
Affective-motivational factors	Organisational commitment	14	6629	.42	.03	.53	.03	[.38, .68]	.01	.01
	Self-efficacy	16	5811	.43	.04	.53	.05	[.24, .81]	.04	.02
	Job satisfaction	23	23354	.49	.03	.59	.03	[.38, .80]	.03	.01
	Work-Family-enrichment	6	2589	.46	.07	.53	.08	[.26, .81]	.03	.02
	Positive affect	5	1629	.46	.07	.55	.09	[.23, .86]	.04	.02
	Relaxation	9	1582	.43	.07	.49	.07	[.22, .77]	.04	.02
	Others ^c	6	981	.40	.06	.46	.08	[.22, .70]	.02	.02
Human energy measure	UWES ^d	49	21707	.47	.02	.47	.02	[.28, .66]	.04	.01
	SMVM ^e	6	3724	.40	.07	.40	.07	[.14, .66]	.04	.02
	Subjective vitality ^f	10	1649	.49	.05	.49	.05	[.28, .70]	.03	.02
	Others ^g	14	15495	.47	.03	.47	.03	[.33, .62]	.01	.01
State vs. Trait	State	20	3128	.47	.02	.56	.02	[.20, .65]	.03	.01
	Trait	59	39447	.42	.04	.48	.04	[.30, .64]	.04	.01

Note. *k* = number of studies, *N* = total sample size, *r* = meta-correlation, *se_r* = standard error of correlation, *CV* = 80% credibility interval, τ^2 = variance indicator, *se* = error of variance of τ^2 . ^a bare bones analysis. ^b incl. correction for measurement error and artefact distribution. ^c incl. well-being, detachment, work-enjoyment, life satisfaction & pleasure. ^d Vigour subscale of Utrecht Work Engagement Scale (Schaufeli & Bakker, 2003). ^e Shirom-Melamed Vigour Measure (Shirom, 2003). ^f Subjective Vitality scale (Ryan & Frederick, 1997). ^g e.g. Productive Energy (Cole et al., 2012), and Professional Vitality (Harvey, 2002).

Table 5

Meta-Analytic Correlations between Human Energy and Performance

Analysis	Category	<i>k</i>	<i>N</i>	Observed ^a		Corrected ^b		80% <i>CV</i>	τ^2	<i>se</i>
				<i>r</i>	<i>se_r</i>	<i>r</i>	<i>se_r</i>			
Total		33	11862	.33	.02	.38	.02	[.22, .55]	.02	.01
Performance	In-role performance	21	8863	.31	.02	.36	.02	[.25, .47]	.01	.00
	Extra-role performance	12	2999	.39	.05	.46	.06	[.20, .72]	.04	.02
Human energy measure	UWES ^c	19	8928	.34	.03	.39	.03	[.23, .55]	.02	.01
	SMVM ^d	6	1598	.35	.04	.40	.04	[.26, .53]	.01	.01
	Subjective vitality ^e	6	974	.27	.07	.30	.09	[.01, .60]	.04	.02
	Others ^f	2	362	.32	.07	.37	.11	[-.03, .77]	.02	.01
Trait vs. State	Trait	24	10456	.34	.02	.38	.03	[.21, .55]	.02	.01
	State	9	1406	.33	.04	.38	.05	[.22, .54]	.01	.01

Note. *k* = number of studies, *N* = total sample size, *r* = meta-correlation, *se_r* = standard error of correlation, *CV* = 80% credibility interval of estimate, τ^2 = variance indicator, *se* = error of variance of τ^2 . ^a bare bones analysis. ^b incl. correction for measurement error. ^c Vigour subscale of Utrecht Work Engagement Scale (Schaufeli & Bakker, 2003), ^d Shirom-Melamed Vigour Measure (Shirom, 2003). ^e Subjective Vitality scale (Ryan & Frederick, 1997). ^f e.g. Productive Energy (Cole et al., 2012).

2.4.3 Hypotheses 3a - 3b

Hypotheses 3 predict a negative relationship between negative work-related consequences and human energy at work. Results are displayed in Tables 6 to 7. Table 6 shows the results regarding Hypothesis 3a. As expected, human energy is negatively correlated with negative well-being outcomes ($\rho = -.41$). All concepts included in the cluster of negative well-being outcomes show significant negative relationships and the confidence interval does not include zero. This result supports Hypothesis 3a. Our analysis support Hypothesis 3b, as the population correlation coefficient between negative work-related behavioural tendencies and

human energy is negative ($\rho = -.30$) and the confidence interval does not include zero (Table 7). All in all, negatively work-related consequences are negatively correlated with human energy at work.

Table 6

Meta-Analytic Correlations between Human Energy and Negative Well-Being Outcomes

Analysis	Category	<i>k</i>	<i>N</i>	Observed ^a		Corrected ^b		80% CV	τ^2	<i>se</i>
				<i>r</i>	<i>se_r</i>	<i>r</i>	<i>se_r</i>			
Total		47	18536	-.35	.02	-.41	.02	[-.61, -.22]	.02	.01
Negative well-being outcomes	Job Stress	6	2127	-.29	.05	-.32	.06	[-.53, -.12]	.01	.01
	Fatigue	3	318	-.49	.06	-.56	.07	[-.73, -.40]	.01	.01
	Negative affect	10	2275	-.20	.02	-.24	.03	[-.31, -.17]	.00	.00
	Emotional exhaustion	23	12280	-.39	.02	-.46	.03	[-.64, -.29]	.01	.00
	Tension	5	1536	-.32	.08	-.39	.10	[-.70, -.08]	.03	.05
Human energy measure	UWES ^c	31	15620	-.36	.02	-.42	.03	[-.63, -.22]	.02	.01
	SMWM ^d	6	1536	-.24	.05	-.28	.05	[-.45, -.12]	.01	.01
	Subjective Vitality ^e	4	729	-.41	.03	-.47	.02	[-.48, -.48]	0	.00
	Others ^f	6	651	-.34	.07	-.39	.08	[-.65, -.13]	.02	.02
Trait vs. State	Trait	39	17509	-.36	.02	-.42	.03	[-.62, -.22]	.02	.01
	State	8	1027	-.28	.05	-.32	.06	[-.52, -.11]	.02	.01

Note. *k* = number of studies, *N* = total sample size, *r* = meta-correlation, *se_r* = standard error of correlation, CV = 80% credibility interval of estimate, τ^2 = variance indicator, *se* = error of variance of τ^2 . ^a bare bones analysis. ^b incl. artefact correction. ^c Vigour subscale of Utrecht Work Engagement Scale (Schaufeli & Bakker, 2003). ^d Shirom-Melamed Vigour Measure (Shirom, 2003). ^e Subjective Vitality scale (Ryan & Frederick, 1997). ^f e.g. Productive Energy (Cole et al., 2012), and Activation Deactivation Adjective Checklist (Thayer, 1986).

Table 7

Meta-Analytic Correlations between Human Energy and Negative Work-Related Behavioural Tendencies

Analysis	Category	<i>k</i>	<i>N</i>	Observed ^a		Corrected ^b		80% <i>CV</i>	τ^2	<i>se</i>
				<i>r</i>	<i>se_r</i>	<i>r</i>	<i>se_r</i>			
Total		23	14380	-.24	.03	-.30	.04	[-.37, -.21]	.03	.01
Negative behavioural tendencies	Workplace deviance	7	1688	-.15	.04	-.18	.05	[-.34, -.02]	.01	.01
	Turnover intention	12	6884	-.28	.04	-.35	.05	[-.57, -.13]	.03	.01
	Others ^c	4	5808	-.23	.08	-.27	.10	[-.60, .06]	.04	.03
Human energy measure	UWES ^d	13	9208	-.18	.03	-.21	.04	[-.40, -.04]	.02	.01
	SMWM ^e	7	1861	-.33	.06	-.39	.07	[-.66, -.12]	.04	.02
	Others ^f	3	3311	-.38	.08	-.44	.09	[-.73, -.15]	.02	.01
Trait vs. State	Trait	18	12938	-.25	.04	-.30	.04	[-.54, -.06]	.03	.02
	State	5	1442	-.22	.03	-.25	.03	[-.26, -.25]	.00	.00

Note. *k* = number of studies, *N* = total sample size, *r* = meta-correlation, *se_r* = standard error of correlation, CI = 95% confidence interval of estimate, τ^2 = variance indicator, *se* = error of variance of τ^2 . ^a bare bones analysis. ^b incl. correction for measurement error. ^c incl. negative reactions, negative attitudes and avoidance. ^d Vigour subscale of Utrecht Work Engagement Scale (Schaufeli & Bakker, 2003). ^e Shirom-Melamed Vigour Measure (Shirom, 2003). ^f e.g. Productive Energy (Cole et al., 2012).

Summing up the results, Table 8 shows the nomological network of antecedents and consequences of human energy at work based on the meta-analysis. It reflects the positive relations between human energy and positively connoted antecedents and consequences and the corresponding negative relations to negatively connoted antecedents and consequences.

Table 8

Nomological Network of Human Energy at Work

Cluster	Work-related Concept	r_{cor}	k	N
Affective-motivational factors	Overall	.56***	79	42575
	Organisational commitment	.53***	14	6629
	Self-efficacy	.53***	16	5811
	Job Satisfaction	.59***	23	23354
	Positive affect	.55***	5	1629
	Work-Family enrichment	.53***	6	2589
	Relaxation	.49***	9	1582
Job and Organisational resources	Overall	.36***	51	25587
	Autonomy	.40***	12	8319
	Job control	.35***	17	7388
	Social support	.30***	10	6591
Performance	Overall	.38***	33	11862
	In-Role performance	.36***	21	8863
	Out-Role performance	.46***	12	2999
Stressors	Overall	-.12***	29	17897
	Time pressure	.10*	10	4961
	Insecurity	-.22***	5	7164
	Job conflict	-.22***	5	3435
	Organisational changes	-.12*	4	1238
Negative well-being outcomes	Overall	-.41***	47	18536
	Job stress	-.32***	6	2127
	Fatigue	-.56***	3	318
	Negative affect	-.24***	10	2275
	Emotional exhaustion	-.46***	23	12280
	Tension	-.39***	5	1536
Negative work-related behavioural tendencies	Overall	-.30***	23	14380
	Workplace deviance	-.18**	7	1688
	Turnover intention	-.35***	12	6884

Note. r_{cor} = sample size weighted and corrected mean effect sizes between the named variables and human energy at work. k = number of studies included into analysis, N = total sample size. Concepts with $k \geq 3$ are included into the Table.

* $p < .05$, ** $p < .01$, *** $p < .001$.

2.4.4 Hypothesis 4 - Moderator Analysis

Hypothesis 4 states that different human energy measures representing the distinct human energy concepts moderate the relationships between human energy and work-related variables, and thus provide empirical distinction. To test Hypothesis 4, we conducted a meta-regression using the Metafor package in R (Hunter & Schmidt, 2004). The relationships between antecedents and outcomes of human energy did not differ significantly between the human energy measures. Thus, when the common 5% significance level is applied, our findings suggest that there is no significant difference between the various human energy measures (see Tables 2-7). Based on these analyses, we conclude that the relationships between human energy and work-related variables are not depending on whether human energy is measured by the SMVM scale (Shirom, 2003), the UWES scale (Schaufeli & Bakker, 2003), or the subjective vitality scale by Ryan and Frederick (1997). All in all, the analyses indicate to reject Hypothesis 4. Nevertheless, the analyses do not sort out the total amount of heterogeneity which means that the results for hypotheses 1 and 2 show significant variance within the studies sample.³ Furthermore, the number of studies used for some moderators is very small ($k < 3$) and thus, the results need to be interpreted with caution.

2.4.5 Sensitivity Analysis and Additional Analysis

In addition to the meta regression, we ran sensitivity analyses to address publication bias. In particular, we used weight models (Vevea & Hedges, 1995) as well as cumulative meta analyses (McDaniel, 2009) to identify whether or not publication bias is to be expected within our analysis. To ensure enough studies to support these tests, we analysed only those constructs represented in at least $k = 10$ (e.g., exhaustion, $k = 23$; in-role performance, $k = 21$; job satisfaction, $k = 23$). Neither weight models showed a significant effect, nor showed the

³ We ran additional analyses and integrated further moderator variables (study design (cross-sectional vs. longitudinal vs. diary design), sample type (student sample vs. working sample), national clusters (countries where the study was conducted)) which in their majority do not influence the relationship.

cumulative meta-analyses a strong impact of studies with lower precision. Thus, based on both analyses we consider that publication biases are unlikely to be present within this study.

Meta-regression analysis was used for additional analysis on how the state vs. trait distinction affects the relationship between human energy and work-related concepts. The results of this meta-regression show no effect of the moderator thus we suggest that this distinction does not influence the relationship between human energy and work-related concepts.

To compare the impact of human energy with the impact of positive affect on individual outcomes, we conducted a dominance analysis using job performance and job satisfaction as outcomes. We focused on these two outcomes because they are among the most frequently examined concepts in organisational psychology, and meta-correlations were available from previous work. Specifically, meta-correlations for positive affect and task performance were derived from Kaplan, Bradley, Luchman, and Haynes (2009), and for positive affect and job satisfaction, from Connolly and Viswesvaran (2000). We conducted multiple regression analysis identifying the additional variance explained by each integrated variable using simple OLS models from psych package in R (Revelle, 2018). Regressing job performance on positive affect in the first step, and human energy in the second step revealed that an additional 4 % of the variance in job performance was explained by human energy in the second step. For job satisfaction, human energy predicted an additional 19 %. Thus, the results (Table 9) of the analysis suggest that energy exhibits incremental validity above and beyond positive affect for job performance and job satisfaction. Still, a great amount of variance is shared by the two concepts positive affect and human energy.

Table 9

Dominance Analysis for Human Energy and Positive Affect in Task (In-role) Performance and Job Satisfaction

Model	R^2	ΔR^2
In-role performance ~ Positive affect	.12	
In-role performance ~ Positive affect + Human energy	.16	.04
In-role performance ~ Human energy	.13	
In-role performance ~ Positive affect + Human energy	.16	.03
Job satisfaction ~ Positive affect	.17	
Job satisfaction ~ Positive affect + Human energy	.36	.19
Job satisfaction ~ Human energy	.35	
Job satisfaction ~ Human energy + Positive affect	.36	.01

Note. R^2 = explained variance, ΔR^2 = additionally explained variance, Models based on meta-correlations retrieved from original study and Kaplan et al. (2009) (positive affect and self-rated in-role performance) and Connolly and Viswesvaran (2000) (positive affect and job satisfaction).

2.5 Discussion

The goal of this meta-analysis was to summarize evidence from almost 20 years of research on human energy to establish a nomological network of human energy at work, and to give insights into the similarities and differences between human energy concepts. The study helps to provide parsimony within this field of research and counters a jangle fallacy. The analyses are based on more than 150 samples and support positive relationships between human energy and positively connoted work-related concepts such as self-efficacy, job performance, commitment, well-being, job autonomy, and organisational support. Our findings support the view of human energy as an activated state which can be fostered by organisational and social support, job autonomy, and person-job fit.

Moreover, our data indicates negative relationships between human energy and work-related concepts such as job stress, negative affect, exhaustion, job insecurity, deviance, and

work-family conflict. Thus, human energy relates to less negative affect, less exhaustion, and less job stress. Additionally, it limits negative behaviours or cognition, such as workplace deviance and turnover intention. In addition, in line with the COR theory (Hobfoll, (1989), our results suggest that perceived insecurity, organisational change, and work-family conflicts seem to hinder human energy. Furthermore, our analyses yielded evidence that the relationships between human energy, as operationalized by the three measures subjective vitality, the SMVM and the vigour subscale of the UWES do not differ in their relationships. This finding lends support for the jangle fallacy (Allen et al., 2014). Taken together, we cannot distinguish between the different human energy concepts in our meta-analysis and thus conclude that they represent different labels for the same phenomenon.

2.5.1 Theoretical Implications

Our study has raised important questions about the nature and definition of human energy, and the differentiability of different human energy concepts. The findings have some implications for the understanding of human energy in the work context and indicate that human energy and its measurement needs clarification.

2.5.1.1 Human Energy is Subject to the Jangle Fallacy.

Based on the finding that the relationships between antecedents and outcomes of human energy do not differ for the different human energy concepts as measured with different scales, and the underlying conceptual overlap, we suggest that the different human energy concepts are equivalent to one another and, thus, do not refer to independent concepts, thereby supporting the assumption of a jangle fallacy within the scope of human energy research. A jangle fallacy describes a situation in which similar concepts are labelled differently resulting in a construct proliferation. It describes the tendency to neglect empirical distinctiveness and to ignore the principle of parsimony, which is a key principle in research (Le et al., 2010). Additionally, Harter and Schmidt (2008) state that addressing this problematic tendency benefits not only the

field of research, but also organisations as it broadens the understanding of conceptually similar things and their impact on other organisational concepts.

Our result is in line with Schaufeli's view that "*psychometric research is necessary on the quality and on the convergent and discriminant validity of questionnaires that tap various positive, work related state of mind.*" (Schaufeli, 2012, p. 6). To be able to counteract the jangle fallacy, we suggest that future research should focus exclusively on one label for human energy, because this would be in line with the claim for parsimony in research and enable researchers to generate systematic as well as cumulative research (Le et al., 2010).

We consider it helpful to use the label human energy for the observed phenomenon to avoid confusion with previous terms and want to highlight that human energy includes previous research on vigour, subjective vitality, and positive activation. We use the term human energy to refer to the level of activated affective state as perceived by the individual which can enable humans to motivate themselves and act and react to different demands.

2.5.1.2 Positive Valence as a Characteristic of Human Energy.

Based on the finding that different human energy concepts do not differ, the question arises if positive valence is a defining characteristic of human energy as noted by Shirom and Quinn, or if human energy is valence-free. The strong relationship with positive affect ($r = .55$) suggests that human energy is a positively connoted concept (see also Quinn et al., 2012). This high interrelation can be explained in different ways. One possible explanation might be the fact that positive affect oftentimes refers to highly activated and aroused states. These states are similar to human energy, and thus are often measured with similar items which creates an overlap and shared variance. Moreover, it becomes obvious that the measures of human energy often include items indicating positive affect. Thus, based on its measures, human energy is mostly a rather positive state, whereas the theoretical conceptualizations do not necessarily lead to this assumption (Quinn & Dutton, 2005). Another interpretation might be that the nature of human energy is positive. The high correlation shown by our analysis indicates energy to be a

positive construct, but it can still be empirically distinguished from states of high positive valence such as enthusiasm, as shown by Daniels (2000). Thus, we conceptualize human energy as distinguishable from other highly positive states but as overall positive.

Our additional analyses approach this phenomenon statistically in an attempt to answer the question - “Does human energy show incremental validity in addition to measuring positive affect?” - which arises when encountering high intercorrelation between the two concepts. The results show that human energy indeed offers incremental validity, as integrating human energy into a model increases the amount of variance accounted for. Human energy has different degrees of importance for different concepts as the additional variance accounted for varies depending on the dependent concept. In our examples, human energy increases the amount of variance accounted for by 4 % for task performance, and 19 % for job satisfaction. Thus, human energy helps to predict work-related concepts above and beyond positive affect. Taken together, our analyses suggest human energy to be a concept worth considering, as it can help to describe work-related phenomena in more depth. Based on our findings, we conceptualize energy as distinguishable from other highly activated positive states but as overall positive.

For future research, we find it more promising to distinguish between human energy as a positive activated state and as a valence-free activated state. For instance, an employee might feel activated because he or she is irritated by the leader or colleague and strives to action in order to prove his or her point. It is an open research question if activation (as a neutral affective state) can be used as a resource to act upon demands (Quinn et al., 2012). Differentiating between positive valence and activation is considered fruitful because the two states have differential effects on motivation (Seo et al., 2004). Affective activation leads to a greater amount of effort invested whereas pleasant affect leads to a more generative and continuous action (Seo et al., 2004). Thus, the differentiation between these affective experiences helps to explain the way employees act at the workplace.

2.5.1.3 Human Energy and Work Engagement

Work engagement is conceptually similar to human energy. In addition to the component of vigour, it includes the two dimensions dedication and absorption (Schaufeli et al., 2006). In this meta-analysis, we integrated the vigour subscale of the Utrecht Work Engagement Scale as a measure of human energy. We find that our results are similar to those of the meta-analysis conducted by Halbesleben (2010). For example, Halbesleben (2010) reports similar relations to performance ($d = .36$ vs. $d = .38$ in our study), and self-efficacy ($d = .59$ vs. $d = .53$). Some of the similarities are due to the conceptual overlap between the measures, but these similarities raise the questions: How do the other two facets of work engagement (dedication and absorption) contribute to the outcomes, beyond the effect of vigour as a concept of human energy? Can human energy and work engagement be differentiated? Thus, future research should examine the differences and similarities between human energy and work engagement in more depth. For example, Schaufeli (2012) states that engagement, similarly to human energy, connotes activation, but not satiation. Contrastingly, job demands show a slight positive relationship to work engagement, but a small negative relationship to human energy, pointing out a difference between the two concepts. What are the conceptual differences and similarities between work engagement and human energy? How can research theoretically and empirically distinguish the two concepts? This would help researchers to clear up current research and provide parsimony, which is a core principle of science (Le et al., 2010).

2.5.1.4 Clarifying the Relationships between Work-Related Stressors and Human Energy

An interesting finding pertains the cluster of work-related stressors and work pressure in particular, which did only show small negative effects or even not the expected negative relationship to human energy.

Based on the COR theory (Hobfoll, 1989) and the findings that stressors are associated with higher exhaustion (LePine et al., 2005) these results seem surprising. Nevertheless, current research on the appraisal of demands offers explanations to these results. For example, Prem,

Ohly, Kubicek, and Korunka (2017) show that the impact of job stressors, such as work pressure, are mostly influenced by their appraisal as challenging or hindering. The authors further propose that the positive and negative effects of work pressure potentially cancel each other out, thus resulting in non-significant relationships (Prem et al., 2017). This is in line with our results, as well as with the findings of van den Broeck, Cuyper, Witte, and Vansteenkiste (2010). One possible explanation might be that the relationship between work stressors and human energy depends on the level of job control, as Carayon and Zijlstra (1999) predicted for work pressure and strain. It would be interesting for future research to test this explanation by integrating an interaction of the challenge and threat appraisal and human energy. Finally, in conformity with the Yerkes–Dodson law (Yerkes & Dodson, 1908), the association between work pressure and human energy might be curvilinear so that an increase in work pressure is energizing up to a certain level, and then starts to deplete energy (Boswell, Olson-Buchanan, & LePine, 2004; Schmitt, Ohly, & Kleespies, 2015). Taken together, all of the observed relationships between job stressors and human energy indicate a small effect ($\rho = -.12$ as compared to $\rho > -.28$ for an average effect size, Paterson et al. (2016)). Our results, along with earlier findings on the curvilinear relationships between job demands and well-being (Rydstedt, Ferrie, & Head, 2006), indicate a curvilinear relationship between human energy (as a well-being facet), and job stressors in general. While our meta-analysis was focused on investigating linear relationships between human energy, and its antecedents and outcomes, future studies might focus on the meta-analytic examination of curvilinear relationships.

2.5.2 Limitations

First, this meta-analysis cannot provide information on the causality of the relations between human energy and the integrated work-related concepts. On the one hand, this is due to the high number of cross-sectional studies examined that do not leave no scope for causal results. Even a subgroup analysis with only longitudinal studies was not conceivable because,

there were only a few longitudinal studies available. On the other hand, the theoretical reasoning is mainly based on arguments concerning reciprocal effects (e.g. COR (Hobfoll, 1989)). Thus, even though previous research argued for directional relationships, the relationships should not be interpreted as causal effects. Second, because this meta-analysis focuses on many different dependent variables, some of them are only measured in few independent samples. For example, fatigue, tension, and detachment are concepts that are only included in three to four independent samples respectively. These relationships need to be interpreted with caution. Third, even after accounting for moderators, there is still some heterogeneity in our meta-analysis. Thus, there is still variance within the study, which cannot be explained by sampling error. This might be due to moderator variables which we were unable to identify. Fourth, we consider the number of human energy measurements included in this study as a limiting factor. When interpreting our results, one needs to consider that most primary studies have measured human energy by using the SMVM, the vigour-subscale of UWES or the subjective vitality scale. Only a few studies ($k < 4$) have used different measures. Thus, the findings pertaining to the fourth hypothesis, that different human energy measures influence the relation between human energy and work-related variables, are limited to these three measures. Lastly, this meta-analysis, as all meta-analyses, is limited to that extent that it only builds on former research and thus can only represent current knowledge on human energy in the work context (Bauer et al., 2007).

2.5.3 Implications for Future Research

Despite its association with outcomes that are positively connoted and commonly considered to be valuable, such as job satisfaction and job performance, it might be that energy also has negative effects. For example, high levels of energy might be invested into goals that are unrealistic, not attainable or beneficial for the individual so as to be attracted towards and engaged in following the wrong goals. This could have negative consequences for relevant

outcomes such as health and well-being (Frese & Fay, 2001; Wrosch, Scheier, Miller, Schulz, & Carver, 2003). Furthermore, it has been argued that high arousal limits individuals' attentional focus (Beal et al.; 2005; Keeler & Cortina, 2018). Tasks that require broad attention would thus suffer from experiencing high levels of energy, which is characterized by high arousal. This assumption is interesting because it points to the process of how energy might be linked to important outcomes. Energy commonly functions as a potential resource, and to become a "resource-in-use", it must be transferred or invested into goals or tasks to result in relevant outcomes such as performance (Quinn et al., 2012). However, it is an open research question how and why energy can be linked to many of the outcomes examined. Enhanced executive functions such as attentional control or cognitive flexibility might explain the relationship between energy and work-related outcomes such as job performance, but alternative explanations (e.g., biological processes such as the activation of autonomic, immune, and neuroendocrine systems) (Dockray & Steptoe, 2010)) need to be considered in future research.

Few studies have examined the fluctuations in energy over time (e.g., over the course of the work day), caused by energy expenditure and energy management strategies (Fritz et al., 2011; Zacher et al., 2014). To find out which types of events or work-related behaviours deplete energy, and which energy management strategies work, and for whom they work, experimental designs and intensive longitudinal study designs are needed in order to assess energy multiple times and model its dynamics. Given that there is unexplained variance in the relationships between human energy and work-related variables such as job stressors, affective-motivational factors and job performance, identifying further boundary conditions is important to clarify under which circumstances human energy is related to the proposed outcomes.

Moreover, more research on the validity of human energy constructs should be considered. To address whether or not human energy is of positive valence, a dominance analysis integrating the different human energy measures is a suitable approach to establish

this. Moreover, dominance analyses help to clarify the unique contribution of each of the concepts to the prediction of certain outcomes, including positive affect. In this manner, research could provide more evidence on the jangle fallacy in the context of human energy and could reach parsimony as a major objective and key for progress in future research on human energy.

2.5.4 Practical Implications

Apart from theoretical implications, our study provides some important practical implications. Leaders should enhance employees' energy by fostering a positive work environment. This may be realized for example, by enabling employees to schedule their work autonomously and thus increase their level of control. Our results suggest that when increasing an employees' energy, organisations foster employees' commitment and motivation at work. Moreover, organisations should protect their employees against negative experiences such as a perceived job insecurity, which could result in less energetic employees. More generally speaking, organisations can foster commitment and performance of their employees by supporting their resource allocation. Thus, providing an environment which comprises social support and autonomy helps to energize, and commit employees to the organisation. Some previous research further revealed that employees may use certain strategies in their daily work to manage their energy level. Example strategies are learning something new, making a to do list, or reading something for fun (Fritz et al., 2011; Zacher et al., 2014). If individuals are successful in increasing their energy at work, this may relate to lower exhaustion, tension, and negative work-related behaviour, but higher relaxation and work-family enrichment.

2.6 Conclusion

This study provides vital information regarding the relationships between human energy and work-related outcomes. Human energy and positively connoted work-related concepts are positively related, whereas negatively connoted concepts are negatively related to energy. Even

though there are some limitations, we can propose that human energy is a resource that helps employees to achieve their objectives and protect them from possible threats and negative affective consequences. Furthermore, our research provides evidence for the jangle fallacy within human energy concepts, resulting in empirically- and evidence-based recommendations to further question the complementary use of different human energy measurements in the sense of achieving parsimony in research.

3 Study 2a: Why do we keep Interrupting Ourselves? Exploring the Reasons for Internal Interruptions at Work.

3.1 Introduction

Improving performance is one major objective of organisations. From struggling to juggle annual targets, cost reductions and employee well-being, organisations are under a lot of pressure to maintain high performance while providing a healthy work environment. Requirements are high not only for companies but also for their employees, who are faced with many demands that occur simultaneously. High workload, complex jobs, and the increased use of information and communication technology result in constant multitasking and interruptions (González & Mark, 2004). Previous research shows mostly negative effects of multitasking and interruptions at work, often resulting from external sources such as incoming calls or emails accompanied by a lack of autonomy. Nevertheless, internal interruptions, the self-determined change of focus from one unfinished task to a secondary task, might have different impacts on employees' well-being and performance. Still, both types of interruptions influence daily work experience and have a great impact on employee well-being and performance (Jett & George, 2003). Thus, it is important to have a closer look at internal interruptions and their antecedents.

Compared to identifying reasons for external interruptions, identifying reasons for internal interruptions appears to be more challenging. Even though two out of five interruptions are caused internally, most research examines reasons and effects of external interruptions rather than those of internal interruptions (Adler & Benbunan-Fich, 2013; Baethge & Rigotti, 2013). Despite the prominence of interruptions at work and the research on their impact on performance and well-being, we can only assume further individual reasons for internal interruptions as research has not yet discovered many antecedents (Baethge & Rigotti, 2013). Based on theoretical arguments and laboratory studies, some argue that boredom or frustration cause internal interruptions, whereas others suggest that the availability of cognitive resources

encourages internal interruptions (Adler & Benbunan-Fich, 2013; Katidioti et al., 2016). Differently, internal interruptions might be used to regain cognitive resources (Adler & Benbunan-Fich, 2013). Human energy, as cognitive resource, should play an important role within these considerations but is not taken into account to date. High levels of human energy enable focused work (Quinn et al., 2012) resulting in the loss of energy as a possible reason for internal interruptions.

Overall, there is no satisfying answer yet and the questions remain: When do employees engage in internal interruptions at work and what situational triggers support these self-started interruptions? Consequently, the objective of this study is two-fold. First, we would like to give insights into the reasoning for internal interruptions at work with an affective as well as a situational perspective and thereby identify drivers of internal interruptions. Second, we aim at providing externally valid conclusions on the topic of internal interruptions at work. To explore the reasons why people, disengage from straining activities at work by interrupting themselves, we conducted a between-subject design. Thereby, we used the critical incident method to examine self-interruptions with the objective to generate qualitative as well as quantitative data and meanwhile increasing external validity.

3.2 Theoretical Background

One of the core concepts of this study is human energy, also called energetic activation. Human energy displays a psychological form of energy and describes the feeling of being energized, vital and vigorous (Quinn et al., 2012). It is a highly activated affective state and described as a resource, which enables humans to act towards stimuli and goals (Hobfoll et al., 2018; Quinn et al., 2012). Human energy can be invested in activities related to the pursuit of work goals, but whether or not this is done depends on whether a person feels committed to the respective work goal or not (Quinn et al., 2012). Resources further enable employees to cope with stress, prevent them from experiencing fatigue, and improve performance (Hobfoll et al.,

2018). To describe the effects of human energy at work in more depth, the Conservation of Resources theory (COR) by Hobfoll (1989) provides a helpful framework. The COR states that individuals strive to retain and foster resources and thereby protect them, as resources are valuable and prevent harm (Hobfoll et al., 2018). Regarding the COR, the ability to keep working on a boring or straining task might be more difficult when resources are low, as coping becomes more difficult and stress increases. Thus, the ability to cope with tasks at work depends on one's resources, e.g. the energy level (Baumeister & Vohs, 2007; Hobfoll et al., 2018). In addition to this internal resource the work environment offers different sorts of resources, which also have the possibility to support an employee's well-being and motivation. External resources, i.e. social support, work autonomy and the task itself, can be helpful to manage different work demands (Hobfoll et al., 2018). Moreover, COR states that humans strive to increase and protect resources through their actions and behaviour (Hobfoll et al., 2018). Transferred to this study, if energy decreases during a task, employees try to find strategies to foster and protect their energy, which might result in an active change of activity, i.e. in an internal interruption at work. This perspective is also supported by Self-Regulation Theory, which suggests that humans need to use strategies to regulate themselves to achieve self-set goals (Baumeister & Vohs, 2007). In the frame of Self-Regulation Theory, a decrease of energy would trigger an alternative behaviour that helps to regain energy and meet self-set goals afterwards (Baumeister & Vohs, 2007). Additionally, the Cybernetic feedback loop by Carver and Scheier (1981) supports this view as it describes that individuals compare their current experiences to an expected standard and change their behaviour to meet one's expectations. In this model, individuals experience positive or negative affect depending on whether they can adjust faster than usual or slower than usual (Carver & Scheier, 1990). Thus, when energy is lower than expected individuals change their behaviour accordingly to reach standards. If this behavioural change does not result in a fast increase of human energy, individuals are expected to experience negative affect, but if energy increases fast and self-set goals can be reached

easily individuals would experience positive affect. Summing this up, next to other resources, energy is described as a resource, which can enable humans to act towards stimuli and goals and thus supports the ability to successfully focus on different tasks, reaching work objectives and preventing internal interruptions (Fritz et al., 2011; Hobfoll, 1989; Quinn et al., 2012).

3.2.1 Internal Interruptions at Work

Internal interruptions are self-started shifts of attention from one task to another. More precisely, they can be described as “internal decisions to stop an ongoing task to attend to another, due to personal thought processes or choices” (Adler & Benbunan-Fich, 2013, p. 1441). Even though 2/5 of all interruptions are caused internally, research mostly concentrates on the closely related external interruptions (Adler & Benbunan-Fich, 2013; Baethge & Rigotti, 2013). One of the reasons for this imbalance is that internal interruptions are difficult to observe or measure (Baethge et al., 2015). This difficulty with internal interruptions is based on the major difference between internal and external interruptions and lies within their cause. In contrast to external interruptions, internal interruptions are not caused by external cues but are caused internally and thus are not easily observed (Jett & George, 2003). Moreover, external interruptions are categorised as stressors, whereas internal interruptions can be seen as a proxy for high job autonomy, which helps employees to deal with obstacles at work and thus can function as a resource (Frese & Zapf, 1994).

Besides external interruptions other concepts such as task switches, breaks, mind wandering and procrastination need to be distinguished from internal interruptions. The named concepts and internal interruptions indeed show some similarities. All of the concepts for example change a person’s work progress, as they bring individuals to attend to other thoughts or actions than planned (Brixey et al., 2007; Czerwinski, Horvitz, & Wilhite, 2004; Kim, Park, & Niu, 2017; Smallwood & Schooler, 2015; van Eerde, 2003). However, one defining characteristic of internal interruptions is the interruption of an unfinished primary task (Brixey et al., 2007), per

definition this is not always the case for task switches (Czerwinski et al., 2004), breaks (Kim et al., 2017) or procrastination (van Eerde, 2003). Instead, all those phenomena might occur before finishing a primary task but are not necessarily linked to an unfinished task. Differently mind wandering is, similarly to internal interruptions, related to an unconscious thought process that occurs during a primary task (Smallwood & Schooler, 2015). Moreover, neither breaks, procrastination nor mind wandering are related to a secondary work task, which again is a defining aspect within this view of internal interruptions (Kim et al., 2017; Smallwood & Schooler, 2015; van Eerde, 2003). Internal interruptions supposedly lead to a secondary task with the plan of resumption after attending to this secondary interrupting task (Brixey et al., 2007), which seems to be a precondition to the idea of task-switching behaviour (Czerwinski et al., 2004). Taken together, internal interruption can be distinguished from other related concepts but also shows some similarities to those concepts based on its defining characteristics. Thus, we regard internal interruption as distinguishable from mind wandering and procrastination but still emphasize a present relation to those concepts. Moreover, internal interruptions cause disruptions (Brixey et al., 2007), disruptions might lead to task-switching and break-taking and thus can be a potential precondition for task-switching or break-taking behaviour.

Interruptions influence daily work experience and have a great impact on employee well-being and performance (Jett & George, 2003). Adler and Benbunan-Fich (2013) started to investigate different reasons for internal interruptions based on their assumptions towards the flow concept and discovered boredom and overload as main drivers for internal interruptions within an experimental setting. Additionally to their approach, COR (Hobfoll, 1989) is able to give insights into the causes of internal interruptions at work. Internal interruptions can be strategically used as resources to reduce stress and improve well-being (Hobfoll et al., 2018). The ability to regulate oneself while working on demanding tasks is additionally described by the Self-Regulation Theory. According to the Self-Regulation Theory, the ability to regulate oneself also depends on affective states and situations which predict a higher or lower chance

of a change of focus at work (Baumeister & Vohs, 2007). Besides the rather specific assumptions that boredom and overload increase internal interruptions, COR as well as Self-Regulation Theory provide a broader perspective on the reasons for internal interruptions. The key factor in both approaches is the aforementioned human energy. Lastly, Carver and Scheier (1990) hint to whether or not self-regulation behaviour (e.g. internal interruptions) results in positive or negative affect, depending on the effectiveness of the used strategy. More effective strategies thus result in positive affect, whereas less effective strategies result in negative affect.

3.2.3 Internal Interruptions as Energy Management Strategies

Human energy can be seen as a key resource for focused work. When employees experience high levels of energy, they are able to invest more effort into work tasks (Quinn et al., 2012). Accordingly, internal interruptions should occur more often when energy is low. They can serve as work-related energy management strategies and enable returning to focused work by replenishing human energy (Fritz et al., 2011; Madjar & Shalley, 2008). Individuals use energy management strategies to protect themselves from stress and fatigue and thereby foster the strength of their individual input for the organisation's success (Fritz et al., 2011). Based on the COR and the Self-Regulation Theory, internal interruptions could be used as work-related energy management strategies in order to increase low levels of energy and change their current state of affect. We therefore hypothesize:

Hypothesis 1. In the case of internal interruptions, individuals will experience a lower level of energy compared to situations in which they engage in focused work.

Low levels of energy are also prone to be related to negative experiences such as fatigue and stress (Fritz et al., 2011; Hobfoll et al., 2018; Zacher et al., 2014). Those negative affective states can be increased by other factors, e. g. by the task or the environment at work. For example, simple and repetitive tasks might result in boredom, which is defined as an unpleasant affective state and results in a lack of interest and the difficulty to concentrate on current tasks

(Eastwood, Frischen, Fenske, & Smilek, 2012; Fisher, 1998). This difficulty and lack of interest can be perceived as stressors, threaten resources and increase work stress. Within situations of boredom and low energy, individuals furthermore perceive their environment as more negative and tend to describe it in negative ways (Eastwood et al., 2012; Fisher, 1998). In behalf of the COR, we would expect that stressors decrease resources and thereby increase the need for strategies to regain resources (Hobfoll et al., 2018). Within the context of our study, boring tasks as stressors would decrease energy, which should result in internal interruptions used as energy management strategies to regain energy. In contrast, Baumeister and Vohs (2007) report that positive affective states, as well as fun tasks, contrastingly increase the ability to focus on work and cope with the task. If coping is efficient one again should experience positive affect (Carver & Scheier, 1990). Thus, we would expect that situations in which employees tend to interrupt themselves are related to negative experiences, e.g. boredom and negative affect, and that situations in which employees work focused are related to positive affective states. Furthermore, Adler and Benbunan-Fich (2013) support this assumption with their experimental study. Thus, we hypothesize:

Hypothesis 2a. In situations in which employees interrupt themselves, employees will experience more boredom and less fun compared to situations in which they engage in focused work.

Hypothesis 2b. In situations in which employees interrupt themselves, employees will perceive the situation more negatively and less positively compared to situations in which they engage in focused work.

3.2.4 Situational Compositions of Internal Interruptions

Aside from individual affective states, situational and task compositions might influence internal interruptions. On the one hand, the COR theory can explain why situational clues influence internal interruptions. On the other hand, Self-Regulation Theory states that situations

impact motivation and regulating behaviour i. e. internal interruptions. In many office jobs, employees are not alone in their offices but surrounded by peers, which results in engaging in various social situations during a working day. Peers can be used as resources through professional advice and support, but at the same time, they can also appear as stressors due to conflicting or disruptive behaviour (Hobfoll et al., 2018). Thus, colleagues can either help with personal or professional support and thereby foster employees' energy at work, or disrupt others by making loud noises, talking on the telephone, or equally asking for support when the other person is trying to concentrate on a difficult task. Thus, the impact of social situations at work is two-fold with similar consequences. First, social situations can be used to re-energize, by interrupting oneself and asking for help or seeking social support. Second, social situations can be demanding and stressful if the behaviour of others hinders workflow and concentration. This again can result in internal interruptions, in which employees relocate effort into other less demanding tasks to pursue an overall goal. Differently to tasks that are performed single-handed, tasks can also require social interaction and frequent feedback from colleagues. Thus, these tasks themselves demand social interactions and thus, would also result in more frequent internal interruptions. Based on this we hypothesize:

Hypothesis 3. In situations in which employees interrupt themselves, employees report more socially demanding characteristics compared to situations in which they engage in focused work.

A motivational perspective on work situations and tasks can also be relevant for the reasons of internal interruptions at work. Baumeister and Vohs (2007) describe motivation as a key factor for the ability to cope with straining situations within the context of self-regulation theory. Situations in which employees are highly motivated are seen as less resource consuming with the result of a higher ability to work focused on a task (Hobfoll et al., 2018). Thus, motivating tasks and situations should increase the likelihood of focused work. Different task

characteristics can be described as motivating. Intellectually stimulating work for example can be seen as an opportunity to use different skills and increase knowledge, which results in higher intrinsic motivation (Gagné, Senécal, & Koestner, 1997). The importance of ones' work for others, so-called task significance, also increases motivation (Baumeister & Vohs, 2007; Gagné et al., 1997). Overall, optimally challenging tasks (e.g. intellectually stimulating tasks), as well as tasks that are important to others and may be evaluated by others, increase motivation (Gagné & Deci, 2005). Thus, those tasks are able to foster the ability to work on tasks over a longer period of time (Baumeister & Vohs, 2007). In addition, employees tend to choose to work on tasks that need their attention the most and thus allocate their resources on tasks with higher duty (Payne, Duggan, & Neth, 2007). Overall, we expect focused work to be associated with more intellectual and dutiful situations and tasks compared to situations in which employees interrupt themselves. Thus, we hypothesize:

Hypothesis 4a. In situations in which employees interrupt themselves, employees report less intellectually stimulating tasks and situations compared to situations in which they engage in focused work.

Hypothesis 4b. In situations in which employees interrupt themselves, employees report less dutiful tasks and situations compared to situations in which they engage in focused work.

3.3 Method

Starting on the 23rd of September 2018 until the 15th of October 2018 we collected data through an online questionnaire using the critical incident technique (CIT) (Flanagan, 1954). The CIT offers the advantage of gaining detailed insights into human behaviour, by asking for precise information about situations that should be explained as detailed and objective as possible (Flanagan, 1954). The CIT is also used for predicting future behaviour and thus allows generalising from one specific situation to similar situations in the future. As a qualitative

approach, it furthermore offers the possibility to gain more information on motives and situational characteristics that might not be easily included into existing measures. Taken together, the CIT is an ideal method to gain detailed insight into the reasons for internal interruptions. Besides its value to gather qualitative data, it further allows participants to fully emerge into the situation they are describing, which reduces retrospective bias when answering additional scales. Using the CIT, we either asked participants to describe a situation in which they engage in focused work (focused CI) or a situation in which they interrupted themselves (interrupted CI).

3.3.1 Sample

The sample included 151 German employees ($M = 31.58$ years, 89 women), after excluding 12 participants because of missing data or misunderstanding the concept of internal interruptions. Participants worked part-time (33 % least five hours a week) or fulltime (67 %) with an overall average of 31.83 working hours a week. The mean tenure was 5.5 years and 28 participants reported a managerial position (19 %). Most of the sample is highly educated with 136 holding a high school diploma (A levels) and 80 reporting a bachelor's or master's degree, 26 % have children living at home. Participants were randomly assigned to describe either a focused work or internal interrupted work situation. Due to the exclusion of participants within the internal interruption group, more participants are included within the focused work group (69 vs. 82), still resulting in a similar age and gender distribution.

3.3.2 Procedure

Starting the questionnaire, participants were asked questions about their employment. Next, they were introduced to the assigned situation. For the focused work CI, they were asked to report a situation in which they engaged in highly focused work without interruptions. They were asked to try to remember the situation, emphasise with it and describe it as detailed as possible. To increase the engagement of participants, we used three primes. First, we asked

about the task, their current work goal and their behaviour in the situation. Second, we asked about the characteristics of the situation, such as the volume and other people around themselves. Third, we asked about the participants feelings within the situation and what they have experienced during it. After the CI, we asked for the time point of the described situation. We further instructed participants to respond to a second questionnaire according to their feelings and the characteristics of the described situation. The procedure for the self-interruption condition only varied in terms of the introduction. We asked participants to describe a situation in which they interrupted themselves and gave examples for self-interruptions (e. g. self-started look on smartphone, change to a second task, continuing working on a private task or a short coffee break).

3.3.3 Measures

Situational characteristics. We measured the situational characteristics with the German version of the short Situational Eight DIAMONDS (S8*) scale developed by Rauthmann and Sherman (2017) which consists of 8 subscales, namely duty (“A job needs to be done.”), intellect (“Situation includes intellectual or cognitive stimuli.”), adversity (“Being criticised”), mating (“Physical attractiveness is relevant”), positivity (“Situation is enjoyable.”), negativity (“Situation is anxiety-inducing.”), deception (“It is possible to deceive someone.”) and sociality (“Social interaction is possible.”). It was measured on a 7-point Likert scale ranging from *extremely uncharacteristic of the situation* to *extremely characteristic of the situation* with the additional option to state *not relevant within this situation*. Cronbach’s alpha was satisfying, ranging between $\alpha = .6$ for duty and $\alpha = .8$ for sociality and intellect.

Positive activation. We measured the participants’ level of activation with the German version of the Activation-Deactivation Adjective Check List (ADACL) by Thayer (1986) validated by Imhof (1998). The ADACL measures two dimensions energetic activation (e. g. active, dynamic) and tension (tense, jittery) on a 7-point Likert scale varying from 1 – *not at all*

to 7 - *very strongly*. Reliability was good with Cronbach's $\alpha = .74$ for energetic activation and $.75$ for tension.

3.3.4 Coding Process – Qualitative Data

For analysing the qualitative data, we oriented the approach on the grounded theory method and its constant comparative method (Glaser & Strauss, 1967; Hallberg, 2006). Two independent coders analysed the data. One of the coders was unfamiliar with the research question and the study's design. The coders first read the responses several times to become familiar with the provided data and information. Next, the coders independently coded each question's response into categories. Afterwards, the coders discussed the categories developed to find identical framing.

3.3.5 Analysing Qualitative Data - Boredom, Positive and Negative Expression

Before integrating the qualitative data into analysis, an interrater agreement analysis was conducted. It resulted in a satisfying Cohen's Kappa above $.8$ before the discussion. The agreement increased to 100% throughout the discussion. For the analysis, we measured boredom by dummy coding the qualitative data on whether or not people reported boredom. For positive and negative expression, we identified the number of negative and positive words used to answer the question regarding the participants' feelings within the described situation.

3.4 Results

Table 10 displays means, standard deviations, and correlations of all measured variables.

Table 10
Descriptive Statistics and Correlations

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9
1. Energetic Activation	3.84	1.02	—	—							
2. Tension	3.43	.90	.05	—	—						
3. Duty	6.17	.96	.12	.04	—	—					
4. Intellect	5.02	1.55	.23**	-.0	.34**	—					
5. Positivity	2.83	1.31	.25**	-.04	-.19*	.20*	—				
6. Negativity	4.55	1.45	-.27**	.35**	.25**	.05	-.35**	—			
7. Sociality	3.74	1.84	.16	.22**	.04	.0	.15	.04	—		
8. Positive word count	1.17	1.27	.25**	-.11	.10	.39**	.32**	-.17*	-.08	—	
9. Negative word count	.95	1.02	-.23**	.30**	-.07	-.12	-.15	.36**	.12	-.41**	—
10 Boredom	.17	.39	-.20*	-.10	-1.4	-.30	-.13	-.04	-.11	-.26**	.22**

Note. $N = 150$. * $p < .05$; ** $p < .01$. (significance level two-tailed).

3.4.1 Test of Hypotheses

We conducted independent-samples t-tests to test hypotheses 1 to 4 comparing the two conditions. Hypothesis 1 proposes that individuals who report internal interruptions display lower levels of energy compared to those who report a situation of focused work. The analyses showed a significant difference in the scores for internal interruptions ($M = 3.62$, $SD = .92$) and focused work ($M = 4.09$, $SD = 1.07$); $t(149) = 2.632$, $p < .001$. Thus, the results suggest that

individuals in fact show lower levels of energy during internal interruptions compared to focused work.

Hypothesis 2a proposes that individuals in internal interruptions report more boredom and less fun compared to situations of focused work. The analysis showed a significant difference in the boredom scores for internal interruptions ($M = .26$, $SD = .47$) and focused work ($M = .09$, $SD = .28$); $t(147) = 2.75$, $p < .001$. Hypothesis 2b proposes that individuals report situations in which they interrupt themselves as more negative and less positive than those who work focused. Analysis showed significant differences between the groups in negative word count ($M_I = 1.28$ $SD_I = 1.03$ vs. $M_F = .68$ $SD_F = .94$; $t(147) = 3.73$ $p < .001$) as well as positive word count ($M_I = .42$ $SD_I = .67$ vs. $M_F = 1.83$ $SD_F = 1.31$; $t(147) = 8.04$ $p < .001$). However, there is only a marginal significant difference between the groups' negativity ratings within the DIAMONDS measure ($M_I = 4.72$ $SD_I = 1.44$ vs. $M_F = 4.39$ $SD_F = 1.45$; $t(149) = 1.39$ $p < .1$). Taken together, individuals use more negative and less positives word to describe situations in which they interrupt themselves compared to focused working phases.

Hypothesis 3 proposes that in situations of internal interruptions, employees report more sociality compared to situations of focused work. Analysis showed a significant difference between the groups ($M_I = 4.09$ $SD_I = 1.84$ vs. $M_F = 3.47$ $SD_F = 1.79$; $t(141) = 2.05$ $p < .05$) regarding sociality of the situation. The results indicate a more socially demanding situation during internal interruptions compared to focused work.

Hypothesis 4 proposes that employees report (a) less intellectual stimulation and (b) less perceived duty in situations in which they interrupt themselves compared to situations in which they engage in focused work. Analysis showed a significant difference between the groups for intellectual stimulation ($M_I = 4.45$ $SD_I = 1.57$ vs. $M_F = 5.54$ $SD_F = 1.36$; $t(146) = 4.53$ $p < .001$) as well as for duty ($M_I = 5.98$ $SD_I = 1.15$ vs. $M_F = 6.34$ $SD_F = .74$; $t(148) = 2.37$ $p < .05$). Thus, people experience tasks and situations in which they engage in focused work as more

intellectually stimulating and more dutiful compared to situations in which they tend to interrupt themselves. In summary, all postulated hypotheses are supported.

3.4.2 Additional Analysis

Even though we did not expect further differences between the groups regarding the other situational Eight DIAMONDS, we conducted an additional analysis, which showed no significant differences between the groups regarding adversity, mating and deception. We further used the quantity of the word concentration named within the qualitative description as a manipulation check. This indicated that our manipulation worked, as there are significant differences when describing the situations ($M_I = .12$ $SD_I = .32$ vs. $M_F = .59$ $SD_F = .50$; $t(147) = 6.77$, $p = .000$). Thus, individuals describe situations of focused work more often as focused compared to internal interrupted work.

3.5 Discussion

The main purpose of this study was to discover affective and situational reasons for internal interruptions among employees. By using a critical incident technique, we found that internal interruptions are prone to happen in states of low energy and socially demanding as well as negative situations. Moreover, people report more negative feelings in these situations and more often report boredom compared to situations of focused work. Based on the COR (Hobfoll, 1989) and the self-regulation theory (Baumeister & Vohs, 2007) we expected that internal interruptions are used as a solution when employees encounter straining tasks in the case of low resources, especially low energy. The results support the assumption that internal interruptions can be used as energy management strategies when resources are low. In line with the self-regulation theory participants also reported higher levels of intellectually stimulating and dutiful tasks during engaging in focused work compared to situations in which individuals interrupt themselves (Baumeister & Vohs, 2007).

3.5.1 Theoretical Contributions

The present research contributes to the literature in several ways. First, it observes the reasoning for internal interruptions at work and identifies affective as well as situational drivers. Previous research mostly focused on external interruptions, or on internal interruptions within experimental settings (e.g. Adler & Benbunan-Fich, 2013; Baethge et al., 2015), but did not investigate reasons for internal interruptions in a setting with high external validity. The results support previous findings by Adler and Benbunan-Fich (2013) and increase current understanding of employee behaviour in different situational settings. Moreover, it gives insights into how employees structure their workday, when they are prone to interrupt themselves, and how affective experiences are important for engaging in work tasks. The study provides this information in a setting closer to real work and thus results in externally valid conclusions for this phenomenon.

Second, the study provides a theoretical framework by drawing on the Conservation of Resources theory (Hobfoll, 1989; Hobfoll et al., 2018) and the Self-Regulation Theory (Baumeister & Vohs, 2007) to explain why certain affective states and situations lead to more internal interruptions than others. Moreover, the Cybernetic feedback loop model by (Carver & Scheier, 1990) explains that negative affect can be explained by non-efficient regulation strategies resulting in other regulation strategies e.g. internal interruptions. Taken together, we propose that internal interruptions can be used as energy management strategies to regain depleted resources, which enables overall goal achievement as also proposed by Madjar and Shalley (2008). Internally interrupting oneself can be seen as an intrinsically motivated strategy to encounter work demands more effectively and handle straining tasks more efficient. These strategies can be interpreted as self-regulation techniques, because of the intention to reach global work as well as personal objectives (Baumeister & Vohs, 2007). Thus, disengaging from straining tasks is not necessarily a bad thing but rather a necessity to continue pursuing set goals. Continuing engaging in straining activities such as boring or negatively connoted tasks

without the required resources might otherwise result in fatigue and stress, as resource loss would further increase (Hobfoll et al., 2018). In summary, we propose that people disengage from straining tasks because of insufficient resource availabilities, in particular because of low levels of energy. We further assume that disengaging from a straining task due to low levels of energy pursues the objective to reallocate energy and enable oneself to fully commit to the task later on.

Moreover, this studies results help to show similarities and differences between internal interruption and related concepts such as procrastination and mind-wandering. Despite the theoretical differences between procrastination and internal interruption, e.g. putting a task a side without the plan to resume it after a secondary task (Steel, Brothen, & Wambach, 2001) vs. the plan to resume the primary task after the interruption (Adler & Benbunan-Fich, 2013), meta-analytical analysis show a positive relationship between procrastination and negative affect (van Eerde, 2003). This is in line with this study's result that internal interruptions occur more often during a negative affective state. In contrast, there are inconsistent findings on internal interruptions and its relation to performance, whereas procrastination shows an overall negative effect on performance (Steel et al., 2001). Taken together, procrastination is different to internal interruptions because the missing intention to resume a primary task shortly after the interruption. Still, procrastination and internal interruptions show some similar effects, whereas the effect on performance (negative vs. positive or negative) can help to differentiate between the concepts. Mind-wandering as another related concept seems to occur more frequently when executive control is low and individuals fail to regulate their own behaviour (Kane & McVay, 2012) which is similar to internal interruptions used as a self-regulation strategy. Still, this distinguishes mind-wandering from internal interruptions as the later may be strategically used and further can help to reach overall goals whereas mind-wandering is not associated with overall performance improvement (Smallwood & Schooler, 2015).

3.5.2 Practical Implications

Our research contributes to practice as well. Past research mostly concentrated on different types of interruptions or used laboratory settings to investigate internal interruptions (Adler & Benbunan-Fich, 2013), whereas this study investigated internal interruptions in a setting close to real work and thus can be seen as more valid for practice. The reasons for internal interruptions may vary, but the unconscious or conscious goal of interrupting oneself could be resource replenishment. Further, resource replenishment helps employees to achieve goals, improve well-being and overall increase organisations success (Fritz et al., 2011). Nevertheless, organisations should try to minimise monotonous or boring work, as those tasks seem to be especially deenergizing and thereby reducing employees' capability to focus on work. Differently, dutiful and intellectually stimulating tasks decrease interruptions and thus might partly be less straining during work. Those tasks might be helpful for employees to effectively structure their workday and prevent them from procrastinating behaviour which otherwise might play a role at work. Moreover, we suggest that organisational policies should enable employees to structure their own work and thereby increase autonomy and giving them the opportunity to decrease monotonous and increase intellectually stimulating work. As sometimes monotonous and boring work is unavoidable, autonomy provides employees with the option to interrupt themselves in case of low energy levels during boring or monotonous tasks. Organisations should foster a culture of acceptance for internal interruptions and thereby help employees to develop strategies to regenerate energy which in turn increases organisational success.

3.5.3 Limitations

Since internal interruptions frequently occur in modern knowledge work, it is important to deepen our understanding of the preconditions which lead to internal interruptions. The present study is helpful in this regard, but also has some limitations. First, the study design is

cross-sectional and cannot give information on causality. We are only able to theoretically reason whether the observed affective states are causes or results of internal interruptions. The cross-sectional design also results in a between-subject analysis which restricts the interpretation of the results as we cannot detect strategic changes within persons based on the data. When first starting data collection, we tried to apply a within-subject design, due to the high amount of effort required from participants this resulted in a drop out of around 98% which unfortunately did not allow any data analysis.

Second, we did not identify any other possible causes for internal interruptions besides affective states and situational characteristics. We further do not know how the observed situational and affective clues interact and thus cannot clearly predict their impact on internal interruptions. Moreover, we assessed the data via self-report and do not have information on the secondary interrupting task.

Third, internal interruptions are difficult to detect and to describe even for those who interrupt themselves (Baethge et al., 2015). With the critical incident approach, we tried to engage participants to truly think about the situation, so they are able to consider the true reasons for internal interruptions. Nevertheless, it is difficult to say if participants truly engaged into the situation and reported adequately to how they felt. Retrospective bias might also interfere here, as participants could choose any situation that happened to them in the past they remembered.

3.5.4 Directions for Future Research

Even though this study helps to greater the understanding of internal interruptions, their reasons and their benefits, research on internal interruptions is still in its early stages. Based on this study future research should explore reasons for interruptions in a setting that decreases retrospective bias. One possible way of doing this is through experience sampling and the daily diary method. Again, studying internal interruptions on a daily basis comes along with other

benefits such as the possibility to investigate whether different reasons for interruptions result in different types of interruptions (e.g. role specific interruption or non-role specific interruption (Anderson, Heissler, Ohly, & David, 2016)) and if they influence performance and well-being differently. Moreover, it is important to empirically distinguish internal interruptions from other related concepts (e.g. mind-wandering, procrastination, breaks or task-switching behaviour). A suitable way to address this issue could be a meta-analytical analysis on the effects of each of the concepts, comparing the results with the help of meta-regression analysis.

Differently, it could be helpful to investigate the phenomenon of internal interruptions with a within-subject design as well as a longitudinal study. This approach would improve the current design regarding its limitations. Within-subject designs could be used to investigate intrapersonal differences regarding interrupted vs. non-interrupted work and a longitudinal design could help to clarify if internal interruptions are periodically or constantly present during work.

Additionally, we did not investigate if there are other factors interacting with those reasons for internal interruptions. It might be helpful to integrate other variables, such as personal traits (e.g. self-efficacy) or motives as they can influence whether and how individuals tend to interrupt themselves. This could be addressed through experimental research where other confounding variables can be controlled. For example, an experimental design with boring tasks and the option to interrupt oneself could hint to whether people who have high self-efficacy beliefs tend to internally interrupt themselves less or if people who are rated high on openness to new experiences tend to search for more interesting, less boring tasks through internal interruptions. Additionally, it would be interesting to integrate if action-oriented people interrupt themselves less, as action orientation has been linked to flow which is a state without internal interruptions (Keller & Bless, 2008). Another interesting research agenda would be to investigate if the relation between internal interruptions and effective energy management is

moderated by different types of interruptions and whether this again is dependent on personal factors. Thus, we could imagine that internally interrupting oneself with a pressing work task would result in a lower improvement of human energy compared to an internal interruption related to tasks that the individual is intrinsically motivated to do (e.g. short chat with a colleague or a walk to the coffee launch). Generating knowledge about these interacting effects would help to understand internal interruptions better and could provide helpful information to structure work more efficiently.

Most importantly, future research should try to find a way to investigate the underlying process of internal interruptions as energy management strategies, because within this research it is a rather theoretical assumption. The results suggest support for this assumption but not truly prove it as we only measured energetic activation once and we do not know how the level of energy changes during and after an internal interruption. Moreover, there is a debate in current research on the ego depletion effect and if describing resources as depleted is even accurate (Inzlicht, Schmeichel, & Macrae, 2014; Lurquin et al., 2016; Wolff, Sieber, Bieleke, & Englert, 2019). The debate highlights previous inconsistencies and questions if depleting of resources has an impact on the behaviour of the employee (Wolff et al., 2019). Thus, it is questionable if internal interruption can be seen as energy management strategy in general. As this study does not meet the needs to provide details on causality and does not show that internal interruptions indeed make work more efficient, it is an important demand for future studies to investigate the underlying processes in more depth. In that manner, an experience sampling approach would also be beneficial because it offers the possibility to integrate a cross-lagged panel analysis as it helps to identify causality within this setting and thus support theoretical assumptions that internal interruptions work as an energy management strategy.

3.6 Conclusion

In conclusion, the study provides a theoretical approach that explains the reasons for internal interruptions and further empirically shows the relevance of affective states and situational characteristics for this behaviour. Moreover, the study indicates an important mechanism; the strategic resource allocation by using internal interruptions as energy management strategies to increase resources and protect oneself from stress and fatigue. Thus, indicating internal interruptions as self-regulation strategies at work.

4 Study 2b: Can Self-Interruptions be used as an Energy Management Strategy? A Diary Study with a Cross-Lagged Design to investigate how Self-Interruptions and Human Energy influence each other at Work.

We have all experienced situations in which we were working on a task and did not know how to proceed. Next, we randomly thought about an email we planned to write but ended up not writing. This situation generally leads to a change of focus from our task, towards the email we just want to send out quickly, back to the original task. These situations are called internal interruptions, and are often experienced by knowledge workers today (Adler & Benbunan-Fich, 2015; Jin & Dabbish, 2009). Internal interruptions refer to changes of focus caused by thoughts, emotional states, or physical needs of the individual and are not linked to external clues or triggers (Adler & Benbunan-Fich, 2013; Jett & George, 2003; Jin & Dabbish, 2009). They occur frequently during a work day and play an important role in daily work life, as they can result in multitasking and have an impact on employee performance and well-being (Adler & Benbunan-Fich, 2013; Baethge & Rigotti, 2010; Jett & George, 2003). Even though the omnipresence of internal interruptions is not doubted, there is only little research on internal interruptions in general, which is mostly conducted in an experimental setting and ignores the work context in which they occur (Adler & Benbunan-Fich, 2013; Katidioti et al., 2016).

These studies identify different reasons (e.g. being bored, feeling exhausted or stuck) and purposes (e.g. to refresh, to reorganise oneself or to gather necessary information) of internal interruptions (Adler & Benbunan-Fich, 2013; Jin & Dabbish, 2009), which hint towards a possible strategical use of internal interruptions. Because previous research mostly used games (e.g. sudoku, memory games (Adler & Benbunan-Fich, 2013; Katidioti, Borst, & Taatgen, 2014)) as primary tasks that show different characteristics, rather than real work tasks, we do not know if this knowledge based on experimental settings can be transferred to the real

world. Besides the different reasons, research mostly comes to the conclusion that internal interruptions are related to negative feelings and that they are disruptive events that result in cognitive costs (Adler & Benbunan-Fich, 2013; Dabbish et al., 2011; Payne et al., 2007). However, research has failed to identify if the negative feelings result out of internal interruptions, or if it is a cause of internal interruptions (e.g. boredom, frustration). This differentiation is crucial as an incomplete state of knowledge can lead to significant misjudgement of the predictors and outcomes of internal interruptions at work. It makes a substantial difference if internal interruptions induce negative feelings, or if the internal interruptions are used as a strategy to improve existing negative feelings by decreasing boredom, reorganising or refreshing oneself.

When a negative experience leads to an internal interruption, it is plausible that the internal interruption can help to improve the negative feelings by redirecting the individuals' attention towards another, more pleasant task. Feeling exhausted for example, is one named reason for individuals to interrupt themselves, and is mostly considered an emotional state that is described by a lack of energy (Quinn et al., 2012; Wright & Cropanzano, 1998). When individuals interrupt themselves because of a lack of energy, these interruptions can work as energy management (Fritz et al., 2011) and thus would be considered strategic. Energy management strategies are used to regain human energy and can help to replenish a resource that is needed to pursue work goals (Fritz et al., 2011; Quinn et al., 2012). Energy management strategies follow the principle of resource conservation which describes that individuals thrive to foster and protect existing resources, as this increases resistance against stressors and other threats at work (Hobfoll et al., 2018). Thus, experiencing a lack of energy results in the need to strengthen the energy resource and find strategies to satisfy this need. An internal interruption can help to rebuild energy and therefore can work as energy management strategy (e.g. by using the interruption to refresh oneself). However, the relationship between human energy and internal interruptions has not been examined until today.

With the help of this study we want to build on earlier research with the objective to examine if internal interruptions indeed can be used strategically by knowledge workers to build up energy. To investigate this phenomenon and achieve our primary aim, we use a daily diary approach with two measures during five consecutive workdays. This approach adds to earlier research by observing internal interruptions, their causes and intentions, in real-work settings and by minimizing retrospective bias. Moreover, it offers the possibility to investigate changes in fluctuating states such as human energy and allows the integration of contextual work factors (e.g. job autonomy), that otherwise might interfere in the relationship between human energy and internal interruptions. By using two measurement times per day, it further allows the examination of possible causal relations between human energy and internal interruptions. Thus, it enables us to investigate if the internal interruptions indeed function as an energy management strategy from different perspectives, whilst respecting the work context in which they occur. Taken together, this study contributes to current research on internal interruptions by providing insights from real-work settings and considering how internal interruptions are used in real-work. Moreover, it sheds light on a possible strategical use of internal interruptions by considering the predictors as well as the outcomes of internal interruptions.

4.1 Theoretical Background

Internal interruptions occur in different situations at work and can cause task switching and multitasking behaviour (Adler & Benbunan-Fich, 2013). They describe a change of focus caused internally, through a process of thought and without external triggers (i.e. remembering an email that should have been written earlier) (Adler & Benbunan-Fich, 2013; Baethge & Rigotti, 2015; Brixey et al., 2007). Internal interruptions distract employees from their primary task, by leading their attention towards a secondary task, prior to the completion of the primary task (Brixey et al., 2007). Thus, the self-started shifts of attention lead towards performing a secondary task which can at least to some degree be anticipated and planned by

the individual (Jett & George, 2003). Besides being predictable, internal interruptions can be directly linked to the work progress of the primary task (e.g. by working on a secondary task that is relevant for the progress of the primary task) which is not necessarily the case, but describes a possible form of internal interruptions (Jett & George, 2003; Jin & Dabbish, 2009).

Internal interruptions can induce task switching behaviour (e.g. switching from preparing a presentation to making a quick phone call and then switching back to the preparations) (Katidioti et al., 2014). Similarly, it is likely that internal interruptions occur more often in situations where employees work on multiple task simultaneously and show multitasking behaviour (Adler & Benbunan-Fich, 2013). Multitasking behaviour in general describes a situation in which an employee works on multiple tasks simultaneously or switches between different tasks (Adler & Benbunan-Fich, 2012). Thus, multitasking behaviour and internal interruptions are interrelated and influence each other (Adler & Benbunan-Fich, 2013; Zimmer & Rigotti, 2015). Another concept that is similar to internal interruptions but can be distinguished from them is mind wandering. Mind wandering is defined as an attention shift away from the primary task towards thoughts that results in non-attendance of external stimuli (Dane, 2018). Internal interruptions are similar to mind wandering in that they also entail an attention shift away from a primary task. However, internal interruptions differ from mind wandering in that they do not come with the same cognitive engagement as mind wandering that results in loss of attention for ones' environment (Smallwood, 2013). Furthermore, mind wandering does not involve a secondary task (e.g. writing an email or closing the window). Mind wandering might lead employees to start working on a secondary task (Dane, 2018), but this is not necessarily the case whereas to act upon a secondary task is one defining characteristic of internal interruptions (Jett & George, 2003; Jin & Dabbish, 2009; Speier et al., 2003).

As discussed above, internal interruptions are omnipresent in everyday work of knowledge workers, as they occur frequently during the work day (Jin & Dabbish, 2009) but

only some research has addressed the phenomenon so far (Adler & Benbunan-Fich, 2013). One reason for missing research on this phenomenon is that internal interruptions are difficult to observe or study because of the thought processes that induce internal interruptions (Baethge & Rigotti, 2015). Still, there are some inconsistent findings on internal interruptions. Research implies positive as well as negative effects of internal interruptions and it is not clear how internal interruptions affect employee well-being (Adler & Benbunan-Fich, 2015; Fisher, 1998; Jin & Dabbish, 2009; Katidioti et al., 2016; Sasangohar, Donmez, Trbovich, & Easty, 2012). Additionally, there has been some research on the reasons and types of internal interruptions (Adler & Benbunan-Fich, 2013; Jin & Dabbish, 2009) which is highly relevant for our research purpose of detecting a possible strategic use of internal interruptions at work.

4.1.1 Reasons for Internal Interruptions and their Intended Outcome at Work

To answer the question why people interrupt themselves is not easy (Baethge et al., 2015) but very important to understand the phenomenon of internal interruptions. Thus far research has described different reasons that were observed in experimental settings or observatory studies (Adler & Benbunan-Fich, 2013; Jin & Dabbish, 2009). In general, there are positive as well as negative triggers for internal interruptions at work. One perspective is that internal interruptions can either be caused by temporarily stopping a non-rewarding task, or by the tendency to attend an unrelated task after completing sub-goals (Payne et al., 2007). Differently, Adler and Benbunan-Fich (2013) qualitatively identified six categories of reasons for internal interruptions. The different categories seem to be interrelated and need further quantitative differentiation. However, they identified negative categories that refer to obstruction (e.g. feeling stuck at a task), exhaustion (e.g. needing refreshment, being tired), and frustration (e.g. working on a too difficult task) and positive categories that refer to reorganization (e.g. finding a strategy to work through the tasks), exploration (e.g. interrupting the task out of curiosity), and stimulation (e.g. avoiding getting bored) (Adler & Benbunan-

Fich, 2013). The positively framed categories (reorganization, exploration, stimulation) hint towards an intended outcome of the interruption whereas the negatively framed categories (obstruction, exhaustion, frustration) seem to represent reasons why people interrupt themselves. However, all categories indicate a strategic use of internal interruptions to improve either the individuals' feelings, or the environment in which they're working. Taken together, the different reasons, which are mostly linked to negative experiences (e.g. frustration, boredom), hint towards the use of an internal interruption with the intention to improve the situation.

Besides answering the question why individuals interrupt themselves, it is worth considering how individuals use the interruptions to identify a possible strategy. Internal interruptions can be used to do tasks that can either be relevant to the progress of the primary task or totally unrelated to it (Adler & Benbunan-Fich, 2013; Jett & George, 2003; Jin & Dabbish, 2009). In general, individuals are more likely to switch tasks when the secondary task is easy, interesting and has a high priority (Wickens, Gutzwiller, & Santamaria, 2015). Jin and Dabbish (2009) integrate these viewpoints and identify seven specific types of internal interruptions in a short observatory study. Each of the types is caused by different triggers and intentions. Adjustments for example, describe an internal interruption that intends to change aspects of the environment to improve productivity on the primary task whereas the cluster breaks includes the work on a more desirable task to recover. Inquiry describes the intention to seek information and recollection is defined by the remembering of the need to fulfil a different task. Routine internal interruptions are based on habits to perform a task at a specific time or sequence, whereas the cluster trigger includes performing a task that is triggered by the primary task. Internal interruptions that are described as "Wait" include waiting on progress of the primary tasks and meanwhile performing unrelated tasks. Those clusters show that internal interruptions can help to finish the primary task faster than expected. Thus, internal interruptions actually help to reach overall work goals by reducing time pressure.

Considering the aforementioned reasons, and the different types of internal interruptions, we assume that information on why people interrupt themselves can hint towards how internal interruptions function and if they can be used strategically. The different reasons indicate that internal interruptions can follow different mechanisms. Especially the types of interruptions hint towards particular intentions or applied strategies which for example improve the environment (adjustments), help to seek necessary information (inquiry), or recover depleted resources by working on a more desirable task (breaks). We investigate the reasons for internal interruptions and the intentions of internal interruptions in a real work setting on an explorative basis, with the aim of gaining insight into the reasoning and discovering a possible strategic use of internal interruptions.

4.1.2 Human Energy as a Primary Resource

Based on the Conservation of Resources Theory (COR) (Hobfoll, 2002; Hobfoll et al., 2018), resources prevent employees from stress and help to enable employees to fulfil their job requirements and work on straining tasks. According to the COR resources tend to foster each other and help to allocate more resources, thus reallocating a particular resource is easier when one has more resources in general. When employees have resources e.g. human energy, they tend to cope better in stressful situations and with stressful tasks. Contrastingly, when resources are low, individuals struggle more with straining tasks, task fulfilment and the protection of other resources (Fisher, 1998; Hobfoll et al., 2018). Thus, when personal resources are low and employees work on straining tasks, individuals tend to interrupt themselves more often to replenish resources by stopping a currently straining primary task (e.g. boring or frustrating task, Adler & Benbunan-Fich, 2013). While working on a secondary less straining or even rewarding task, resources can be regained and recovered (e.g. represented by the cluster break by Jin and Dabbish (2009)). In this case, internal interruptions could function as a strategy which helps individuals to replenish their resources and enable them to return to focused work

afterwards (Fritz et al., 2011; Madjar & Shalley, 2008). As resource recovery is described as one of the intended outcomes of internal interruptions (Jin & Dabbish, 2009) and experiences (e.g. boredom and frustration) that are closely related with low levels of the resource human energy are identified causes of internal interruptions (Adler & Benbunan-Fich, 2013), the use of internal interruption as possible energy management strategy appears convincing. The personal resource human energy enables employees to invest effort into task fulfilment and thus provides the foundation for performance and goal achievement of knowledge-workers (Fisher, 1998; Quinn et al., 2012). Having human energy is a positively activated state that is described by feeling vital, alive, and vigorous (Quinn et al., 2012). Whereas low states of human energy are characterised by the feeling of being drained and exhausted and thus are more likely in situations in which individuals experience frustration or boredom, which are identified reasons for internal interruptions (Adler & Benbunan-Fich, 2013; Quinn et al., 2012).

Taken together, we propose that if human energy is low, individuals interrupt themselves to replenish energy and thus strategically use internal interruptions as an energy management strategy. Moreover, internal interruptions should increase human energy during the workday, as they can help to replenish resources. In contrast, we do not believe that internal interruptions work as stressors depleting human energy, as they can be planned ahead and are under the control of the individual (Jett & George, 2003). Thus, we hypothesize:

Hypothesis 1a. Low levels of human energy before lunch lead to an increased number of internal interruptions at work in the afternoon.

Hypothesis 1b. The number of internal interruptions in the morning increase human energy in the afternoon.

4.1.3 Identifying Job Autonomy as another Important Resource

As mentioned above, resources travel in caravans and ought not to be investigated neglecting other resources (Hobfoll et al., 2018). To address this request, we integrate one

additional important resource in this context, namely job autonomy. Having job autonomy is linked to multiple positive outcomes. It increases the perceived control over the job environment and in turn motivates employees to master new tasks and new challenges (Bakker & Demerouti, 2007; Fried & Ferris, 1987; Morgeson, Delaney-Klinger, & Hemingway, 2005). There are two different paths through which job autonomy can influence internal interruptions and their impact on human energy. Job autonomy enables internal interruptions because job autonomy allows employees to structure their work according to their needs (Hacker, 2003). As job autonomy brings the advantage that employees can decide to interrupt themselves when they feel the need for a short break, having job autonomy facilitates the strategic use of internal interruptions.

Moreover, job autonomy influences the relationship between internal interruptions and human energy. The presence of job resources in general fosters resource preservation and enhancement (Hobfoll et al., 2018). Thus, having job autonomy can help to recover personal resources more easily, by enabling the employee to actively decide which task to work on and motivating the employee to perform better and structure work according to their needs. When human energy is low and the employees decide to interrupt themselves to regain it, they tend to be more successful when they can autonomously decide how to structure their work and what to do next. The individual can then choose to work on easy, more interesting tasks which allows the individual to recover cognitive resources (Fritz et al., 2011; Zacher et al., 2014). Thus, when job autonomy is high, internal interruptions can be more successfully used as energy management strategies, but when job autonomy is low, internal interruptions do not lead to the same improvement of human energy. When job autonomy is low, internal interruptions as a short-term adjustment of the work schedule, can even be perceived as stressors as the employees cannot integrate them into their action plan. Taken together, we expect a direct effect of job autonomy increasing internal interruptions as well as an interacting effect that moderates the relationship between internal interruptions and human energy. Following, we propose:

Hypothesis 2. Employees who have higher job autonomy interrupt themselves more often than individuals who have lower job autonomy.

Hypothesis 3. Job autonomy increases the effect of internal interruptions on human energy. When job autonomy is high, the relationship between internal interruptions in the morning and human energy in the afternoon is stronger than when job autonomy is low.

4.2 Method

4.2.1 Procedure and Sample

This study was conducted over a three-week period from end of May till mid-June in 2019. We recruited participants through a snowballing technique using personal contacts and social media channels (e.g. Facebook, LinkedIn, Xing) where we posted a flyer about the studies purpose and requirements. Participants were required to work at least 30 hours a week and have a typical office job thus being knowledge-workers. As an incentive, participants could win one out of 15 vouchers for a country wide store that also offers the possibility to order online. Interested participants sent an e-mail to assign for participation. After signing in, participants received more information on the studies procedure. Participants were asked to complete a general online survey beforehand and two short surveys each day (one before lunch and one at the end of the workday) during a period of five consecutive working days (i.e. one workweek from Monday to Friday). Participants received e-mail-reminders on the study every day at 11 am and 3 pm. After completion participants were asked to once again answer the general online survey.

231 employees signed up to participate in our study and a total of 197 participated at the baseline survey. After excluding participants who worked less than 30 hours a week and/or participated less than at two daily-dyads (midday and afternoon survey in the same day) the total sample reported a total of 711 midday and 665 afternoon surveys. We matched each

midday survey with the evening survey of the same day what resulted in a total of 636 matched day-level data sets from 161 participants.

The final sample included 161 persons (60.2 % female), with a mean age of 33.4 years ($SD = 10.89$) and the majority being highly educated as 61.1 % hold a university degree. Participants worked in various occupations and industries, for example finance (16.2%), administration (13%), HR (13%) and computer sciences (11,7%). Average job tenure was 68.46 months ($SD = 105.99$) with 35.47 ($SD = 8.59$) hours per week and 24.7 % held a supervisory position. 23.4% reported to have children at home with 1.33 children at home on average. To test selective attrition, we compared the final sample of 161 persons with the 36 persons who did not provide complete data. We found no significant difference regarding gender, $\chi^2(1) = 4.87, p = .088$, age, $t(192) = -1.17, p = .24$, education $t(187) = -1.57, p = .118$, job tenure, $t(192) = .332, p = .74$, working hours per week $t(192) = -.217, p = .83$ and job autonomy $t(192) = .570, p = .57$.

4.2.2 Measures

All Items were presented in German. Table 1 shows means, standard deviations, Cronbach's alpha, intraclass correlations and intercorrelations of all study variables.

4.2.2.1 Daily Measures

In the daily surveys we assessed the number of internal interruptions during the last working hours (half day), the reasons for these internal interruptions, the intended outcome of these internal interruptions, whether they were relevant to the primary task, and human energy.

Internal Interruptions. To investigate internal interruptions, we first described what internal interruptions are and gave different examples what internal interruptions can look like (e.g. Checking emails without receiving a notification, making a call, and opening or closing the window). We then asked participants to report the number of internal interruptions they remembered during the first (or second) half of the day. “Now think about the whole afternoon.

How often did you internally interrupt yourself during work this afternoon? Please report whole numbers and try to be as precisely as possible.”

Table 11

Descriptive Statistics, ICC, and Correlations Descriptive Statistics, ICC, and Correlations

Variable	<i>M</i>	<i>SD</i>	ICC	1	2	3	4	5
1. Vigor T1	3.95	.99	.40	—	.24*	-.23*	-.11	
2. Vigor T2	3.58	3.74	.43	.87**	—	-.15*	-.17*	
3. No. of. Interruptions T1	3.48	3.33	.46	-.17*	-.24*	—	.24*	
4. No. of. Interruptions T2	3.48	1.55	.56	-.15*	-.12*	.91**	—	
5. Job Autonomy	3.83	.73		.05	.08	-.03	.03	—

Note. In column 1 and 2, means and standard deviations at the between-person level are displayed.

ICC = Intraclass Correlation. Below the diagonal are correlations at the between-person level ($N=144$); above the diagonal are correlations at the within-person level ($N=596$). The correlational analyses at the within-person level do not account for the nesting of day-level variables within persons. * $p < .05$; ** $p < .01$.

Reasons for Internal Interruptions. We used a checklist to observe the reasons for internal interruptions and asked participants to report the reasons for one internal interruption they remember. Participants could choose out of a list with 12 different reasons and could choose more than one reason. Sample items are “The task was boring.”, “The task was frustrating”, “I was tired/exhausted.”, “I needed help from others.”, “I wanted to reorganize myself.”, and “I am used to interrupting myself during work.”. Participants had the chance to give an additional answer, if they felt that the given responses did not represent the reason for the described internal interruption.

Intended Outcome of Internal Interruptions. Again, we used a checklist to observe the use of the internal interruption reported and asked participants how they used one internal interruption. Participants could choose out of a list with 11 different intentions/uses and could choose more than one item of the list. Sample items are “To recover.”, “To adjust my environment, so I can work better.”, “To avoid forgetting another task.”, “To write an important e-mail.”, “To look at my smartphone.”, and “To distract myself from work.”. Again, participants had the chance to give an additional answer, if they felt that the given items did not represent their intentions.

Human Energy. To assess human energy we used the tiredness-vigour subscale of the German version of the short-form 10-item Daniels five-measure of affective well-being (D-FAW) (Russell & Daniels, 2018). Participants reported how they felt right now in this moment. The D-FAW consists of five subscales each represented by two items each. Participants indicated how they felt on a six-point likert scale ranging from “not at all” to “very strongly”. The items for the tiredness-vigour dimension are “motivated” and “tired”. Cronbachs’ alpha ranged from $\alpha = .6$ to $\alpha = .73$ in the evening and from $\alpha = .61$ to $\alpha = .75$ during midday for five workdays. Additional, confirmatory factor analysis confirmed that both items (motivated and tired) load on the same component.

4.2.2.2 General Survey

In the general questionnaire we assessed demographics and autonomy.

Autonomy. Autonomy was assessed in the base line survey. To assess autonomy we used the German version of the work-design questionnaire (WDQ) (Morgeson & Humphrey, 2006; Stegmann et al., 2010). The WDQ differentiates between three forms of autonomy, work scheduling autonomy, decision-making autonomy, and work methods autonomy and is answered on a 5-point likert rating scale ranging from 1 (strongly disagree) to 5 (strongly agree). Sample item are “The job allows me to plan how I do my work.” (Work scheduling autonomy),

“The job gives me a chance to use my personal initiative or judgement in carrying out the work.” (decision-making autonomy) and “The job allows me to decide on my own how to go about doing my work.” (Work methods autonomy). As a confirmatory factor analysis did not indicate three separate factors, we summarised the three scales into one job autonomy scale for further analysis. Cronbachs’ alpha resulted in $\alpha = .90$.

4.2.3 Data Analysis

For our analysis we used a cross-lagged panel diary design and assessed internal interruptions, and human energy at both time points during each day. Additionally, we analysed a cross-level interaction to analyse hypothesis 3. In line with earlier research we used structural equation modelling (SEM) and considered the structure of the data with repeated measures being nested within individuals (Finkel, 1995; Little, Preacher, Selig, & Card, 2007). To estimate the models we used Mplus, version 7.11 (Muthén & Muthén, 1998-2017).

Two variables are on the within person level, one as a latent variable (human energy) and one as an observed variable (number of internal interruptions) and job autonomy as a latent variable on the between-person level. To correctly specify a cross-lagged panel model, the part of this model representing the cross-lagged relationships with human energy and number of internal interruptions needs to include the correlation between the variables at T1; the stability of each construct between T1 and T2; and the two cross-lagged paths (Lang, Bliese, Lang, & Adler, 2011). Our specified model included human energy (T1 and T2), number of interruptions (T1 and T2). We specified a model that included the stability coefficients as well as the cross-lagged structural path from T1 human energy to T2 number of internal interruptions, resulting in a full cross-lagged panel model. Additionally, to this cross-lagged panel model, we modelled a cross-level interaction in the model with job autonomy (T0) as moderator of the cross-lagged relation of the number of internal interruptions (T1) and vigour (T2).

We estimate the models using the maximum likelihood estimation with robust standard errors (MLR) due to the clustered data and report only fully standardized results. We centred the within-person variables around the group-mean, to control for all between-person variance as recommended by Ohly, Sonnentag, Niessen, and Zapf (2010). Model fit was assessed using the chi-square goodness of fit test. A non-significant χ^2 - value indicates a good fit between the specified and empirical covariance matrix (Schermelleh-Engel, Moosbrugger, & Müller, 2008). Additionally, we evaluated model fit using Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI) and the Standardized Root Mean Square Residual (SRMR) as descriptive fit indicators. As recommended by Schermelleh-Engel et al. (2008) values less than .05 for RMSEA and SRMR and values of .97 or higher represent a good fit.

4.3 Results

Before running the main analysis, we computed intraclass correlations (ICC) for all study variables (see Table 10), to examine the variance components of our day-level data. The ICCs ranged from .40 to .56 showing that 60 % to 44 % of the observed variance is within-person variance and multi-level modelling is adequate.

4.3.1 Test of Hypothesis

According to hypothesis 1a the level of human energy before lunch increases the number of internal interruptions in the afternoon. When employees experience low levels of energy before lunch, employees should interrupt themselves more often compared to experiencing high levels of energy before lunch. Model fits for our model are provided in Table 11 and Figure 4 shows the cross-lagged structural equation model including all effects. As represented in Table 3 a good fit was achieved with the fully cross-lagged model ($\chi^2(3) = .69, p = .88, RMSEA = .00, CFI = 1.00$ and $SRMR = .01$). As indicated in Figure 1, after controlling for the stability of human energy ($\beta = .22, p < .05$) and the number of internal interruptions ($\beta = .20, p < .001$), the cross-lagged effect of human energy before lunch on the number of internal interruptions in the

afternoon was not significant ($\beta = -.12, p = .07$). Thus, the results do not support Hypothesis 1a. The cross-lagged effect from the number of internal interruptions on human energy ($\beta = -.06, p = .34$) was not significant either, again not supporting Hypothesis 1b that states that a higher number of internal interruptions increase the level of energy in the afternoon.

The expected direct effect of having job autonomy on the number of internal interruptions was proposed in hypothesis 2. The analysis revealed no direct effect of job autonomy on the number of internal interruptions ($\beta = -.016, p = .87$) not supporting hypothesis 2.

Hypothesis 3 describes the cross-level interaction of job autonomy on the relation between the number of interruptions before lunch and human energy in the afternoon. It states that when job autonomy is high the relationship between human energy and internal interruptions is stronger than when job autonomy is low. When adding the moderator variable into the model, the main effect remains non-significant. The interaction effect is not significant either ($\beta = .08, p > .05$). Hypothesis 3 is not supported.

Table 12
Summary of Results, Coefficients and Model Fit Indices for the Full Sample (N=596)

<i>Test</i>	<i>Model 1: Baseline Model with only Autoregressive Effects</i>	<i>Model 2: Autoregressive Effects and Internal Interruptions (T1) and Vigor (T2)</i>	<i>Model 3: Autoregressive Effects and Vigor (T1) and Internal Interruptions (T2)</i>	<i>Model 4: Fully Cross-lagged Model</i>
RMSEA	0.03	.00	.02	.00
CFI	0.98	1.00	1.00	1.00
SRMR	0.03	0.01	.02	.01
χ^2	11.64	1.71	4.77	0.69
<i>df</i>	7	4	4	3
<i>p</i>	.11	.79	.31	.88

Note. RMSEA = Root mean square error of approximation; CFI = Comparative fit index; SRMR = Standardized root mean square residual;

χ^2 = Chi-square test of model fit.

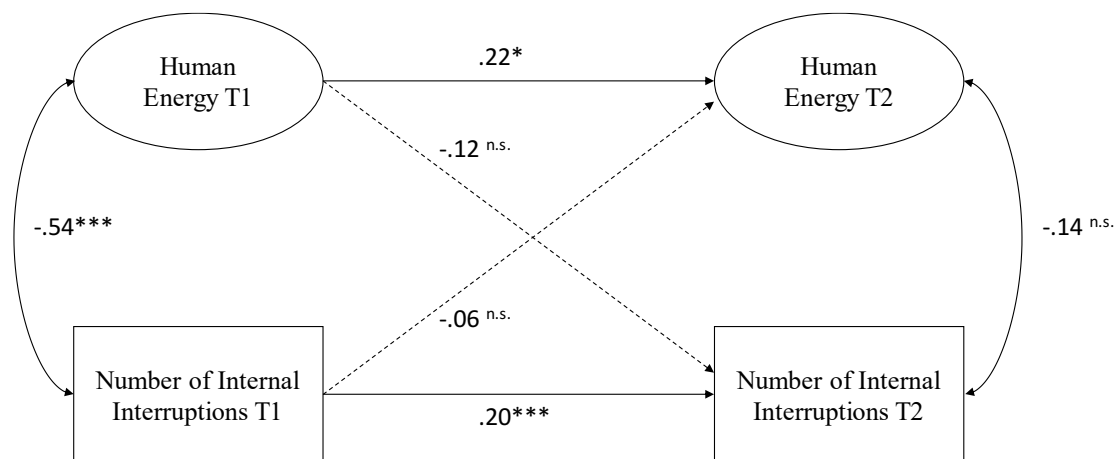


Figure 4. Estimates of the structural model.

Note. Relationships between human energy and the number of internal interruptions. Factor loadings and covariances between indicators are not indicated. T1 = time 1; T2 = Time 2. * $p < .05$; ** $p < .01$; *** $p < .001$. Figure 1. Estimates of the structural model. Relationships between human energy and the number of internal interruptions. Factor loadings and covariances between indicators are not indicated. T1 = time 1; T2 = Time 2. * $p < .05$; ** $p < .01$; *** $p < .001$.

Besides testing the hypothesis, we have a closer look at the reasons for and intended outcome of internal interruptions as shown in Figure 5. 72 % of participants reported an internal interruption in the morning and 63 % reported an interruption in the afternoon. We used explorative factor analysis (principal component analysis) with varimax-rotation to establish if the different reasons and intentions load on similar factors. The explorative factor analysis revealed five factors for the reasons and four factors for the intentions. The reasons can be clustered into “Frustration/Exhaustion” (incl. being frustrated, exhaustion, feeling overstrained and feeling tired), “Boredom” (incl. being bored and lack of motivation), “Reorganisation” (incl. needing help, reorganising oneself and feeling too busy) and “Habit” (incl. task switch out of habit and new ideas). Having too many parallel tasks could not be included into one of

the factors and becomes a single factor. The intended use of the interruptions can be clustered into “Unrelated work tasks” (incl. finding information, avoid forgetting another tasks and doing another unrelated tasks), “Task progress” (incl. doing another related tasks, writing an email), “Private tasks” (incl. waiting, private tasks, distraction, smartphone use) and “Recovery” (incl. recovery and adaptation of environment). Figure 5 displays the frequency of the named clusters.

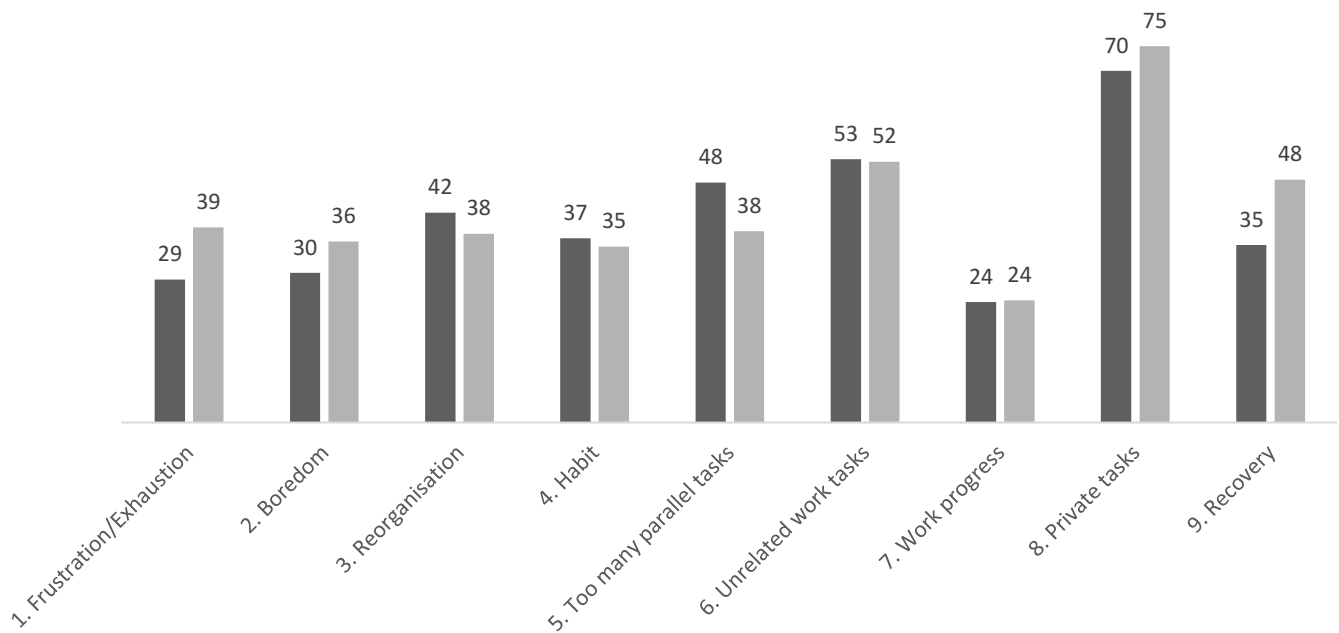


Figure 5. Frequency of the named clusters.

Note. Proportionally named reasons (1 - 5) for and intended outcome (6 - 9) of the internal interruptions during the morning (dark grey) and the afternoon (light grey). $N_{\text{morning}} = 549$; $N_{\text{afternoon}} = 490$. Multiple answers were possible, numbers display the percentage of the named reason with regard to the total number of interruptions in the morning or the afternoon.

In the morning participants report too many parallel tasks (48 %) and reorganisation (42 %) most often as a reason for one internal interruption they experienced (multiple reasons might have been ticked). In the afternoon participants report frustration/exhaustion (39 %) and too many parallel tasks (38 %) as reasons for the internal interruption. The biggest difference between morning and afternoon can be observed for the frequency of many parallel tasks and

feeling tired. Participants used the interruptions to accomplishing private tasks (70 %) most often during the morning. In the afternoon, accomplishing private tasks (75 %) as well as recovery activities (48 %) were ticked most often. Last but not least, participants indicated whether the internal interruption was relevant for the work progress. According to them, around 41 % of the interruptions were relevant for the work progress in the morning and the afternoon.

4.3.2 Additional Analysis

To analyse the data encompassing we additionally analysed the cross-level interaction of job autonomy on the relation between human energy before lunch and the number of interruptions in the afternoon. The analysis resulted in a significant effect of $\beta = -.29, p < .05$. However, when reran the analysis using Mplus, the standard error of the results varied due to different starting value and varying numbers of iterations. Mplus than reported an error, that the coefficients are not trustworthy Thus, the effect is not robust and cannot be trusted.

4.4 Discussion

This study aims at shedding light on a possible use of internal interruptions as an energy management strategy by using a daily diary study design. This study considers the presence of human energy to help employees to work focused and thereby reduce internal interruptions at work. It additionally examines a cross-level interaction of job autonomy on the relation between internal interruptions and human energy to gain a broader perspective on the resources-interruption relationship. We also observe why employees interrupt themselves and how they use the interruption on an explorative basis, to better understand internal interruptions as an energy management strategy. With the use of a cross-lagged panel design, we can generate consensus on the relationships and provide more insights on the reasons and effects of internal interruptions in a real-work setting. Our analyses indicate no direct effect of human energy on internal interruptions over the course of a workday or vice versa. The results only indicate a short-term relationship between human energy and internal interruptions during the morning.

In contrast to our expectations, having high job autonomy does neither increase the numbers of internal interruptions, nor does it strengthen the effect of internal interruptions in the morning on levels of human energy in the afternoon. Additional analyses hint towards a strengthening effect of job autonomy on the relationship between human energy in the morning and internal interruptions in the afternoon. When employees experience low levels of energy and have the freedom to structure their work according to their needs, employees tend to interrupt themselves more often compared to when they experience high levels of energy. However, the results of the additional analysis were not robust and thus need to be interpreted with caution. The explorative analysis develops earlier findings by identifying five clusters as reasons for internal interruptions and four clusters of intended outcomes of internal interruptions. Furthermore, it distinguishes workload as the most important trigger for internal interruptions and accomplishing private tasks (especially smartphone use) as typical activity during internal interruptions which have not been identified yet. Previous studies developed clusters of internal interruptions based on qualitative studies, and the quantitative approach in this study helped to confirm earlier findings and to reorganise the clusters. In contrast to earlier findings (Adler & Benbunan-Fich, 2013), we showed that frustration and exhaustion belong to the same category instead of being two independent categories. One category seems fruitful as frustration and exhaustion are shown to be interrelated (Vander Elst, van den Broeck, Witte, & Cuyper, 2012) and as both are linked to a lack of resources (Hobfoll et al., 2018). Thus, it might be difficult for employees to differentiate between the two states. However, boredom as another cluster can be distinguished from the first cluster as shown in previous studies. Moreover, the results support four clusters for the intended outcome of internal interruptions instead of seven (Jin & Dabbish, 2009). The identified clusters adjustment, inquiry and recollection from previous research (Jin & Dabbish, 2009) can be compiled into one cluster based on the results of the explorative factor analysis. All of these clusters similarly describe the use of internal interruptions for task unrelated work purposes. Thus, it seems easier to differentiate broader

clusters as the smaller clusters load on one single factor. Additionally, we found support for the increase of smartphone use the past years and its relatedness to work on private tasks at work. Nowadays, it is easier to accomplish all kinds of work-unrelated tasks and thus accomplishing private tasks during work seems easier and more relevant today (Syrek, Kühnel, Vahle-Hinz, & Bloom, 2018). The results support this and show that “accomplishing private tasks” is one cluster that has not been identified in a previous observatory setting (Jin & Dabbish, 2009). Taken together, the results show that individuals indeed interrupt themselves because of a lack of energy (e.g. cluster frustration/exhaustion or boredom) but also because they want to reorganise themselves or they simply have too many different tasks to accomplish. Moreover, we now know that individuals often times use the interruption to do non-work-related tasks, and sometimes to pursue an overall work goal. Thus, the reasons and intentions hint towards a possible strategic use.

4.4.1 Internal Interruptions as Energy Management Strategy

The results do not indicate a direct relationship between human energy in the morning and internal interruptions in the afternoon and vice versa. However, they do hint towards the idea that the relationships are affected by other variables e.g. other resources, organisational factors, and the activities during the interruption. It is plausible that dependent on how the interruption is used, it can be strategically used to increase resources (Fritz et al., 2011; Zacher et al., 2014). However, our data did not allow this analysis and showed no direct effect from the level of human energy in the morning on the number of internal interruptions in the afternoon. Thus, we like to consider alternative explanations. At first, it is possible that human energy and internal interruptions indeed do not affect each other over a longer period of time. This would lead to the assumption that internal interruptions do not support long-term energy reallocation but also that internal interruptions do not have a long-term impact on well-being, especially on human energy, which is contrasting earlier findings (Adler & Benbunan-Fich,

2013; Katidioti et al., 2014; Sasangohar et al., 2012). However, the fact that internal interruptions and human energy measured in the morning are related, does imply a short-term relation between the two concepts. Moreover, it is possible that the relationship can be shown easier over shorter periods of time, as human energy is a fluctuant state that varies across work days (Ten Brummelhuis & Bakker, 2012).

Second, we believe that there are more variables relevant to the observed relationship. Hence, we think that for an internal interruption to work as an energy management strategy, other factors are needed for success. For example, internal interruptions do not work as energy management strategies, if a change of the work plan would act as stressor because the work environment itself does not allow spontaneous alterations in the work plan. According to Hobfoll et al. (2018), resource preservation is difficult when stressors are present. Thus when energy is low and individuals interrupt themselves without a supporting work environment, the internal interruption itself would build a conflict to the work progress (Hacker, 2003). Hence, these interruptions would not support energy preservation as much as internal interruptions that are supported by the environment. Next to organisational and personal factors that might influence the relationship, the activity performed by employees during the interruption can have an impact. Some characteristics of the secondary task can play an important role. Earlier findings show that internal interruptions have different effects on performance and job satisfaction based on what participants did during the interruption (Jin & Dabbish, 2009). Consequently, we believe that the intended outcome of the interruption is crucial for the success of an internal interruptions as an energy management strategy. Our results, for example, show that around 40 % of the interruptions are work-related, those work-related interruptions can be used for different tasks which can either work as energy management strategy or not (Fritz et al., 2011; Zacher et al., 2014). Micro-breaks as one example seem to work as EMS (Zacher et al., 2014) but are mostly not work-related. Thus, micro breaks (e.g. getting a coffee) might possibly work as an EMS whereas doing another task might not work. Moreover, another

example is important considering how people use the interruption. Half of all interruptions in our sample led to smartphone use, but increased smartphone use is linked to negative consequences on performance and well-being (Gökçearsan, Mumcu, Haşlaman, & Çevik, 2016), which again can diminish the positive effect internal interruptions might have on human energy. These arguments highlight the importance of other variables affecting the expected results.

Third, it is important to integrate the reasons for internal interruptions into this framework. For example, employees interrupt their current work, because they have too many tasks or they would forget something if they did not interrupt their current task. This situation would not necessarily be linked to energy management strategies, as those interruptions are not caused due to low energy, but rather due to insufficient capacity to reach work objectives in time. When instead interruptions are namely caused by being tired, which would be a proxy for low human energy (Daniels, 2000), these interruptions could help to increase the low levels of human energy. The reasons for internal interruptions may as well go hand in hand with the intended outcome of the internal interruption. Thus, when employees interrupt themselves because they would forget another task otherwise, this probably leads to doing the other task or at least to writing a to do list which are activities that could not be associated as energy management strategies so far (Fritz et al., 2011; Zacher et al., 2014). Taken together, it is possible that the specific form of internal interruption deals as an energy management strategy, whereas not all internal interruptions do so.

All in all, we state that human energy and internal interruptions are not directly related over a long period of time (e.g. from before lunch to before end of the workday). Thus, internal interruptions do not increase human energy over the period of a workday, but at the same time, they do not negatively influence human energy across a workday. Nevertheless, we believe that when integrating other factors, the relationship between human energy and internal interruptions can indeed be shown.

4.4.2 The Broader Framework of Human Energy and Internal Interruptions

Based on the COR Theory (Hobfoll et al., 2018) we expected that having high job autonomy (organisational resource) would strengthen the process of resource replenishment. Our results did not support this suggestion, but instead indicated that high job autonomy increases the relationship between human energy in the morning and internal interruptions in the afternoon. Thus, when energy is low in the morning and employees experience high autonomy in their jobs, they tend to interrupt themselves more often. Still, there was no direct effect of job autonomy on internal interruptions. Even though resources in general foster each other (Hobfoll et al., 2018), it is possible that not all resources can be used for the same purpose (e.g. working focused). Whereas human energy helps to work focused and can increase motivation (Quinn et al., 2012), job autonomy might either work as a resource that protects employees from the effects stressors might have (Hacker, 2003) but would not increase focused work. Moreover, job autonomy is a resource that is directly linked to the organisational context and employees cannot easily influence the given conditions (Morgeson et al., 2005). Thus, having job autonomy can be positive for some, whereas for others the same amount of job autonomy can be stressful (Morgeson et al., 2005). However, whether or not having high job autonomy is perceived as positive or negative was not assessed by our design and thus could not be integrated into the analysis. When job autonomy itself is perceived as a stressor, it hinders the positive effect of internal interruptions on human energy and could increase the need for interruptions based on low levels of energy considering a downward spiral within the resources-stressor relationship (Hobfoll et al., 2018).

Additionally, the results show that employees have partly different reasons to interrupt themselves during the first half of the day compared to the second half of the day. Having too many different tasks parallel to each other seems to be the main reason, why people interrupt themselves all day. Thus, the high workload, especially during the first half of the day, triggers internal interruptions. But over the course of a workday the lack of motivation as well as being

tired becomes more relevant for employees and leads to internal interruptions. When people get tired during the course of a work day because of work demands, they need strategies to recover (Hülshager et al., 2014; Parker, Sonnentag, Jimmieson, & Newton, 2019; Sonnentag & Zijlstra, 2006). At the same time after working long hours motivation decreases, which again results in the loss of human energy (Reijseger et al., 2016). In turn, this increases the intended objective of internal interruptions to regain energy to accomplish tasks, which seems to be a logical consequence when interpreting internal interruption as energy management strategy. In comparison to the use of internal interruptions in the morning being used to work on another task that they might have forgotten otherwise, in the afternoon employees use the internal interruptions to relax and recover.

Taken together, our data is collected with a high external validity and supports earlier findings on internal interruptions (Adler & Benbunan-Fich, 2013; Dabbish et al., 2011; Jett & George, 2003; Jin & Dabbish, 2009) but also provides no evidence for the supportive function of job autonomy when using internal interruptions as EMS. Our study complements earlier research by identifying high workload as main driver for internal interruptions and private tasks as main activity during these interruptions. Moreover, our analysis also indicates that internal interruptions indeed are used to relax and recover or to accomplish private tasks that are not work-related.

4.4.3 Limitations and Future Directions

As most empirical studies, our study has some limitations. First, we like to address that all data is collected via self-report, which may result in common-method bias (Podsakoff, MacKenzie, & Podsakoff, 2012). However, as we used a multilevel analysis, modelling all direct effects on within-person level cancelling out between-person differences, we can exclude biases in our within-level data due to these differences. Again, we only measured the number of internal interruptions on self-report basis, which might lead to an over- or underestimation

of the true amount of internal interruptions. Even though it is difficult to measure internal interruptions differently, we suggest for future research to include objective measures of the number of internal interruptions. Another idea would be to measure human energy through physiological data collection (e.g. heart-rate variability). Both approaches would help to counteract the common-method bias and would result in multisource data.

Second, we only asked for the reasons and activities during one internal interruption and not all internal interruptions. Moreover, we used an explorative factor analysis to cluster the reasons and intentions which can lead to difficulties for bivariate data (Gorsuch, 1997). Thus, the results of the factor analysis need to be interpreted with caution and we could not reasonably include the reasons or activities into our inferential statistics, as we do not know why and how the other interruptions occurred during the workday. The reasons and types of internal interruptions might have a major impact on how internal interruptions affect other relevant work outcomes such as performance or well-being in general. For a start, it would be beneficial to empirically test how the different reasons and types of interruptions affect the relationship between human energy and internal interruptions. This would help to identify useful energy management strategies and could also build on Fritz et al.'s (2011) and Zacher et al.'s (2014) work.

Third, data was collected two times a workday. This procedure does not allow for an accurate investigation into whether internal interruptions function as energy management strategies over the short-term or not. Thus, it would be beneficial to include a third measurement point resulting in one measure before an internal interruption occurs (e.g. early in the morning to assess baseline human energy), one directly after the internal interruption (identifying the reasons and the activities of the interruption) and another short scale on human energy shortly after the assessment of the interruption. Or in general shorten the measurement intervals. This complex design could give more insights into the effect of internal interruptions on human energy but is rather difficult to assess. Maybe it would be good to integrate physiological

measurements (e.g. heart-rate-variability) to assess human energy, which would result in a less invasive measurement method and would allow the normal workflow of the participants. This could also directly show whether or not the internal interruption improves human energy or not.

Fourth, in this study we only included job autonomy as a possible moderator. Thus, we cannot give insights into the impact of organisational resources in general. Integrating other resources (e.g. social support) as well as personal resources (e.g. self-efficacy) could help to investigate the relation between internal interruptions and relevant resources in more depth. It would be interesting to see how other resources affect this relationship, as it is possible that high self-efficacy for example indeed reduces the need to interrupt oneself as energy management strategy. Differently, high social support might lead to an increase of internal interruptions as the social support can be used to restore human energy, by supporting the employee to overcome obstacles such as boredom or frustration (Cheng et al., 2014).

Fifth, as mentioned earlier it is difficult to differentiate between internal interruptions and other related concepts. We discovered that some participants had problems with differentiating between external and internal interruptions, as they for example identified a received call as a reason. Even though we excluded participants that openly reported external interruptions, we cannot say with certainty that all the interruptions that are reported by the participants are internally caused.

Lastly, this study focuses on the relation between human energy and internal interruption, which is only a small part of research in the field of internal interruptions. Our study showed that internal interruptions indeed are relevant for today's work and are strongly affected by workload or the casual habit to check the smartphone while working. Thus, it would be beneficial to investigate internal interruptions in broader perspectives, e.g. how internal interruptions affect performance in real work setting in addition to earlier lab studies (e.g. Jin & Dabbish, 2009). Moreover, it would be interesting to examine how personal characteristics

and organisational norms influence internal interruptions and explore if a high acceptance of internal interruptions influences how those interruptions are used.

4.4.4 Practical Implications

Today, most of the knowledge-workers are used to being interrupted or interrupting themselves. This study suggests that it is not bad for employees to interrupt themselves as those interruptions don't seem to harm the employees' energy and thus do not negatively affect other work-related factors (e.g. well-being). Moreover, it might be beneficial for an organisation to allow internal interruptions as they indeed can help the employee to manage their energy levels if other supporting factors (e.g. social support, job autonomy) are present. Nevertheless, it might be helpful for organizations to develop guidelines on how to use internal interruptions, to ensure that that they do not interfere with performance outcomes but still have a positive effect on well-being or energy (for example see Zacher et al., 2014).

4.5 Conclusion

With the help of this study we investigated why people interrupt themselves and if those internal interruptions can function as energy management strategies. The results suggest no direct relationship between internal interruptions and human energy over the course of a workday and thereby neglect the idea of internal interruptions being an EMS. However, the results also indicate other variables to be affecting this relationship (e.g. job autonomy). Moreover, the study sheds light on the drivers and intended outcomes of internal interruption in real work settings, supporting earlier findings and highlighting multiple tasks at work to be the main reason why people interrupt themselves. Thus, our results foster the progress of understanding how internal interruptions at work are caused and how they affect employees.

5 Study 3: Interrupt yourself! When it Comes to Creative and Planning Performance Switching Tasks at Your Own Pace Beats Concentrated and Externally Interrupted Work

5.1 Introduction

Knowledge workers today are not only expected to pursue several work goals at once (König, Bühner, & Mürling, 2005), they are also increasingly connected and available for incoming communication. The rise of information and communication technologies (ICT) makes it easy to access information and answer messages independent of location, but at the same time ICT offers more distractions and sources of interruptions than ever before. In fact, a representative survey of German employees states that 56% of participants think digitalization has increased the frequency of multitasking required at work (DGB-Index Gute Arbeit, 2017). This illustrates that, among other work demands such as time pressure and a high workload, frequent interruptions are one of the most common demands knowledge workers face (Baethge et al., 2015; Jett & George, 2003; Speier et al., 2003).

Interruptions can either arise from external sources (external interruptions) or internal sources (internal interruptions). Both types of interruptions involve switching to a secondary task temporarily. Literature normally treats task switching as a broad concept that describes switches between tasks for different reasons (González & Mark, 2004; König et al., 2005). We use the term task switching more narrowly to describe the switch from a primary to a secondary task after an external or internal interruption. External interruptions are usually defined as uncontrollable, unpredictable events, which temporarily shift the attention of an individual from his or her current primary task toward the interruption (Speier et al., 2003). Research shows that they generally impact performance and well-being negatively (e.g., Baethge & Rigotti, 2013; Speier et al., 2003). In contrast, internal interruptions are self-initiated attention shifts and can be anticipated by the individual (Jett & George, 2003). Drawing on Action Regulation

Theory (ART) (Frese & Zapf, 1994; Hacker, 1973, 2003, 2005), internal interruptions should not come with the same negative consequences as external interruptions as they can be included into an action plan which alleviates disruptive effects. Nevertheless, earlier research has mainly described internal interruptions conceptually (Jett & George, 2003) or has investigated external interruptions because internal interruptions “are not directly observable, [which] makes them difficult to study” (Baethge et al., 2015, p. 309), resulting in a lack of knowledge about the effects of internal interruptions on performance. Specifically, it remains unclear if the effects of internal interruptions on performance are distinct from the effects of external interruptions. Internal interruptions have often been blamed for depleting attentional resources and hindering task performance in the same way as external interruptions. However, this assertion has not been tested yet and it is unlikely that the two concepts are interchangeable as they are distinct on critical facets, for example the level of individual control associated with internal and external interruptions. Additionally, the underlying mechanisms by which both types of interruptions affect performance remain underexplored.

To address this gap in research, we investigate internal interruptions along external interruptions in two experiments with two different performance outcomes. We aim to integrate internal interruptions into a model based on German Action-Regulation Theory (Frese & Zapf, 1994; Hacker, 1973, 2003, 2005) that has been successfully used to explain detrimental effects of external interruptions (Baethge & Rigotti, 2013). Building on ART, we develop and test a theoretical framework that describes how external and internal interruptions differently affect performance in a creative task and a planning task. While creative tasks require an individual to generate new ideas and use flexible thinking (Lu, Akinola, & Mason, 2017), for planning tasks it is necessary to correctly identify relevant information and think in strategic ways (Funke & Krüger, 1995; Phillips, Kliegel, & Martin, 2006). These skills are required in most knowledge worker jobs. Specifically, we propose that in comparison to external interruptions, internal interruptions do not lead to a decline in performance due to their self-determined and

advantageous timing. Additionally, we suggest that internal interruptions can improve performance by either an energy management process or a motivational process. First, when it comes to energy, one could assume that individuals initiate internal interruptions to replenish energy resources (Adler & Benbunan-Fich, 2015; Fritz et al., 2011; Fritz, Ellis, Demsky, Lin, & Guros, 2013; Madjar & Shalley, 2008; Zacher et al., 2014). Second, regarding the autonomy process, the ability to decide when and how to switch between tasks should be reflected in the level of perceived autonomy over tasks which has been consistently linked to improved performance (Langfred & Moye, 2004). We investigate and compare both possible processes.

Our paper makes several contributions to the literature. First, our study contributes to the broader literature on interruptions at work by directly comparing effects of internal and external interruptions on two different performance outcomes. Previously, both types of interruptions have only been investigated separately with only a few studies focusing on internal interruptions (Adler & Benbunan-Fich, 2013). In a similar vein, we investigate if the predominantly negative view on interruptions (e.g. interruptions must always be avoided as they reduce task performance) holds true for all types of interruptions in different tasks. More specifically, we examine the effects of interruptions on performance in a creative task as well as in a planning task. This extends our understanding of the conditions affecting the consequences of interruptions. Second, we contribute to theory by offering an insight into the process by which interruptions affect performance. Specifically, we examine both an energetic and an autonomy perspective that could be used to explain the distinct effects of both types of interruptions on performance. Finally, by allowing for only one interruption in both conditions, we can ascribe the consequences of the interruption to the different characteristics of internal and external interruptions. As research by Baethge et al. (2015) has stressed, cumulative interruptions might affect outcomes in qualitatively different ways, which emphasizes the importance of keeping the number and frequency of interruptions constant when investigating qualitative differences of external and internal interruptions. Previously, the number of

interruptions was not kept constant between conditions (Lu et al., 2017; Madjar & Shalley, 2008), making it difficult to compare the two concepts.

In the next sections of our paper, we build on ART (Frese & Zapf, 1994; Hacker, 1973, 2003, 2005) as a theoretical framework to account for distinct effects of external and internal interruptions on performance and introduce external and internal interruptions as core concepts. Building on this, we offer two contrasting explanations for the different effects of external and internal interruptions on performance. First, we give an overview over the perspective that internal interruptions go hand in hand with successful energy management and thus contribute to task performance (Adler & Benbunan-Fich, 2013; Fritz et al., 2011). Second, we introduce an alternative motivational perspective which assumes that internal interruptions increase the perception of high autonomy and thus improve performance. To clarify this, we conducted two laboratory experiments to provide insights into the underlying processes and discuss our findings in detail.

5.1.1 Action-Regulation Theory

Action-Regulation Theory offers an explanation of the effects of interruptions on performance. The central aspect of ART (Frese & Zapf, 1994; Hacker, 1973, 2003, 2005) is the action goal, since all human action is goal-directed. The action process is cyclical and can be subdivided into six phases. In addition to this cyclical action process, actions are also seen as hierarchical. Each goal can be subdivided into several sub-goals, which, in turn, can again be subdivided. The more complex a goal, the more sub-goals and hierarchical levels exist for the action. Each sub-goal is again characterized by a cyclical process. Actions on different hierarchical levels require different levels of regulation. Goals on a higher hierarchical level need a more conscious regulation than lower level goals, as they are more complex and cannot be automated by the individual. For example, the complex goal of preparing a PowerPoint presentation for a conference consists of several steps. Planning how to communicate the

research message requires regulation at the *intellectual level* since a conscious analysis is necessary. However, for sub-goals at a lower level the action might already be organized into a schema, e.g. when the sub-goal is to design a slide presenting the results of the study (*level of flexible action patterns*). Below that, on the *sensorimotor level*, the visible actions, e.g. pressing a key, are performed. Those visible actions do not require conscious regulation and can proceed automatically, unless something unexpected occurs.

5.1.2 Core Concepts: External and Internal Interruptions

In the context of ART (Frese & Zapf, 1994; Hacker, 1973, 2005), external interruptions are classified as stressors – so-called regulation obstacles. Obstacles are defined as aspects of work that impede or prevent an employee from reaching a set goal. Supporting this view, past research supports the view that external interruptions require immediate reactions and thus suspend goal-directed action and force employees to change their focus at least for some time (Brixey et al., 2007; Speier et al., 2003). Coping with regulation requires the exertion of additional effort and time and can therefore lead to time pressure (Baethge & Rigotti, 2013; Frese & Zapf, 1994).

In contrast, internal interruptions have not yet been integrated into Action-Regulation Theory. They can be described as “internal decisions to stop an ongoing task to attend to another, due to personal thought processes or choices” (Adler & Benbunan-Fich, 2013, p. 1441). The reasons for internal interruptions are diverse. Among others, boredom and overload have been shown to be internal triggers (Adler & Benbunan-Fich, 2013; Fisher, 1998). While external interruptions are by definition unpredictable, the timing of internal interruptions is under personal control (Speier et al., 2003). Due to their predictability and controllability, internal interruptions do not necessarily impede or prevent an employee from reaching a set goal. Therefore, in the framework of ART internal interruptions would not be classified as regulation obstacles.

5.1.2 Effects of External Interruptions

A number of cross-sectional, experimental, and diary studies demonstrate the negative impact external interruptions have on performance (Baethge & Rigotti, 2013; Bailey & Konstan, 2006). External interruptions are detrimental to task execution as they are usually unexpected and often happen at inconvenient times (Jett & George, 2003; Nijstad & Stroebe, 2006; Nijstad, Stroebe, & Lodewijkx, 2003). But even the expectation of an unpredictable external interruption can have a negative effect, for example decreased task performance (Bailey & Konstan, 2006).

After an external interruption occurred and has been dealt with, individuals can only return to the primary uncompleted task after a so-called resumption lag (Brixey et al., 2007). A resumption lag describes the time needed to retrieve information to the working memory that is necessary for returning to the primary task. An employee might find it difficult to return to his or her primary task as he or she might need to repeat the whole action, or repeat parts of the action process (Frese & Zapf, 1994), in which case the resumption lag would be longer adding up to a more disruptive interruption. Thereby, external interruptions can increase time pressure or even result in individuals resorting to more risky alternative actions to be able to complete the primary action on time (Baethge & Rigotti, 2013; Frese & Zapf, 1994). When individuals can prepare for an interruption, for example, by writing down necessary information, the resumption lag is considerably shorter. Thus, the resumption lag slows down task continuation to different extents. Additionally, negative performance outcomes might be based on the fact that interrupted people forget about the intended next action steps for the primary task while being interrupted. Because of these reasons, external interruptions often decrease task performance.

Moreover, the effect of external interruptions is not limited to task performance. They also negatively impact well-being, affect and stress-levels (Bailey & Konstan, 2006; Sonnentag, Reinecke, Mata, & Vorderer, 2018). For example, individuals experience a higher

level of annoyance when they are interrupted, during both the primary and secondary task (Bailey & Konstan, 2006). This detrimental effect can be partly explained by increased time pressure which is in turn experienced negatively (Baethge & Rigotti, 2013; Frese & Zapf, 1994; Sonnentag et al., 2018). Further, it is also likely that being interrupted is itself a negative experience (Jett & George, 2003).

With regards to moderating factors, the complexity and monotony of tasks influence the effect of external interruptions, with positive performance outcomes for less complex and more monotonous tasks (Baethge et al., 2015; Speier et al., 2003). Since the individual needs to reconstruct more, and more complex information related to the task, higher effort is needed to resume a primary task at a higher hierarchical level. Therefore, especially when the tasks are intellectually demanding and complex external interruptions impact performance negatively, as they affect both efficiency and performance quality (Baethge, 2013; Bailey & Konstan, 2006; Speier et al., 2003). Moreover, the specific timing of an interruption is crucial. To make an external interruption less disruptive it must not occur during an ongoing cyclical action process. Supporting this notion, it has already been shown that interruptions happening at a suitable time and between tasks are less disruptive (Adamczyk & Bailey, 2004; Bailey & Konstan, 2006; Czerwinski, Cutrell, & Horvitz, 2000; McFarlane & Latorella, 2002). Ideally, an interruption occurs when a subset of actions has been completed and a sub-goal has been achieved. Goal achievement can then serve as a cue for task resumption and will make it easier for individuals to pick up the action process at the action step where they were interrupted (Adamczyk & Bailey, 2004).

While current research mostly focuses on negative effects of interruptions, evidence for positive performance effects of external interruptions can be found in the task switching literature focusing on creative tasks. These divergent findings demonstrate that the nature of the task affects the impact of external interruptions. Having to switch between several tasks has been shown to enhance creative performance in several studies (Dijksterhuis & Meurs, 2006;

Madjar & Shalley, 2008; Sio & Ormerod, 2009; Zhou & Hoever, 2014). Lu et al. (2017) argue that setting aside a task to engage in a different one reduces cognitive fixation and thus improves performance. One example is the so-called incubation effect. It describes the unconscious continuation of information processing that occurs while individuals consciously focus on a secondary task which can result in an “aha” effect and improved performance for creative as well as decision-making tasks (Dijksterhuis, 2004; Madjar & Shalley, 2008). In some studies, performance benefits occur specifically when participants have to perform multiple switches between creative tasks (Lu et al., 2017). Based on these divergent findings and the incubation effect we examine two different types of task performance. We analyse the effects of interruptions on a planning task which we expect to be negatively affected by external interruptions and a creative task which we expect to be positively affected by external interruptions.

5.1.4 Effects of Internal Interruptions

To date, little research has focused on internal interruptions. For this reason, we mostly rely on the conceptual differences of external and internal interruptions and use theoretical arguments to support our hypotheses. Moreover, we draw upon some studies investigating the boundary conditions reducing the detrimental effects of interruptions.

Adler and Benbunan-Fich (2013) state that the main difference between external and internal interruptions lies within their cause. External interruptions result out of external or environmental clues, while internal interruptions are internally motivated and are impacted by internal clues. Further, individuals can include anticipated interruptions into their action plan by adapting the action plan or the action goal during task execution. In contrast, whenever interruptions are unexpected the employee is not able to adapt his or her action plan and cannot prepare a resumption strategy in advance. Anticipation of and control over the timing of interruptions is mostly given in the case of internal interruptions but rarely given in the case of

external interruptions. Therefore, it can be assumed that in the case of internal interruptions individuals are able to prepare for the accompanying task switch to the secondary task and the return to their primary task. This makes a crucial difference for performance outcomes. For example, an employee anticipating an interruption can write important information down or can plan how to resume the primary task. The employee still needs to step away from the primary task to deal with the interruption, but it significantly reduces the resumption lag and the mental effort needed to resume the primary task afterwards (Brixey et al., 2007; Frese & Zapf, 1994). Furthermore individuals can interrupt themselves and switch to the secondary task at opportune or even favourable moments, e.g., when they have finished a sub task or achieved a distinct sub-goal at a higher level (González & Mark, 2005; Payne et al., 2007). Thereby, the task switch does not interrupt an ongoing action process and goal achievement can serve as a cue for task resumption, which will make it easier for individuals to return to the primary task (Adamczyk & Bailey, 2004). For these reasons, even though a resumption lag also occurs for internal interruptions, they should be less detrimental to performance.

Empirically, the notion that anticipation reduces the negative impact of interruptions is supported by an experimental study by Carmeli et al. (2009) showing that the performance of participants who were able to anticipate interruptions suffered less. Additionally, Rouncefield, Viller, Hughes, and Rodden (1995) demonstrated less of a negative effect when interruptions in an office environment occurred only during set times of day and week as they could be better anticipated. In a similar vein, control over the timing of interruption reduces their detrimental impact (McFarlane, 2002). Finally, research by Adler and Benbunan-Fich (2015) provides evidence for a positive impact of being able to determine the switching between tasks. Since individuals can anticipate and control internal interruptions, which is rarely the case for external interruptions, we generally assume that compared to external interruptions, internal interruptions will lead to better performance outcomes. However, contrary to the general negative effect of external interruptions, we also expect a positive effect of external

interruptions within a creative task due to the above mentioned incubation effect (Madjar & Shalley, 2008) as the dissolution of cognitive fixation should exceed the negative consequences of external interruptions. To test this assumption, we therefore propose that:

Hypothesis 1a. For creative tasks, an internal interruption leads to improved performance compared with (a) an external interruption and (b) no interruption; and an external interruption leads to decreased performance ratings compared with (a) an internal interruption and improved performance ratings compared with (b) no interruption.

Hypothesis 1b. For planning tasks, an internal interruption leads to improved performance compared with (a) an external interruption and (b) no interruption; and an external interruption leads to decreased performance ratings compared with (a) an internal interruption and (b) no interruption.

5.1.5 Energy Management Perspective on Interruptions

Action-Regulation Theory can be used to explain why internal interruptions do not lead to diminished performance. However, we propose that internal interruptions in fact improve performance when compared with working without interruptions and being externally interrupted due to their positive impact on energy as suggested by Madjar and Shalley (2008). Energy describes an activated affect that is defined by its state of invigoration and the experience of vitality (Ryan & Frederick, 1997). Moreover, feeling energetic is consistently and positively related to higher performance at work (Carmeli et al., 2009; Dubreuil, Forest, & Courcy, 2014; Ryan & Deci, 2000). According to Hobfoll (2011), over the course of a work day transient resources such as energy are depleted due to work demands. Still, energy resources can be restored by certain energy management strategies (Fritz et al., 2011; Zacher et al., 2014). Internal interruptions can be used as energy management strategies. When employees fail to achieve a state of flow with an ongoing task (Adler & Benbunan-Fich, 2013) or when they feel

overtaxed (Jin & Dabbish, 2009) they might interrupt themselves and switch to a secondary task to replenish energy resources. The work-related energy management strategies *making a to-do list* and *checking and updating one's schedule* increased feelings of vitality on a within-person level (Zacher et al., 2014). While Zacher et al. (2014) did not find a positive impact on vitality for switching tasks in general, switching to a task based on an internal interruption that is less complex and requires regulation at a lower hierarchical level (Frese & Zapf, 1994) might be the deciding factor for successful energy management (Ohly et al., 2017). Thus, we suggest that internal interruptions (e.g. switching to a different work task) might increase energy and thus lead to higher performance outcomes if a low-complex secondary task is chosen.

Moreover, since external interruptions are regulation obstacles (Baethge & Rigotti, 2013; Frese & Zapf, 1994), they are typically experienced as demanding and will not have the same replenishing effect and even deplete energy resources further as regulation obstacles require the exertion of additional effort (Baethge & Rigotti, 2013). Further, employees who work uninterrupted deplete their energy resources to a higher extent than when they can initiate internal interruptions as they do not have the opportunity to switch to a less demanding task when they feel overtaxed.

To summarize, internal interruptions increase energy whereas external interruptions reduce energy which then boosts or hinders task performance. We expect that task switches from a primary task to a secondary task and back caused by an internal interruption increase feelings of energy which results in increased task performance. Further, we expect task switches caused by external interruptions to decrease energy and impair performance.

Hypothesis 2. An internal interruption leads to higher energy after task completion compared with (a) an external interruption and (b) no interruption; and an external interruption leads to lower energy after task completion compared with (a) internal interruption and (b) no interruption.

5.1.6 Autonomy Perspective on Interruptions

In addition to potentially restoring energy resources, internal interruptions could also boost performance because they increase the perception of task autonomy. Task autonomy reflects the extent to which a job allows an individual to schedule work tasks, and to decide on the method and strategy for executing them (Hackman & Oldham, 1975; Jackson, Wall, Martin, & Davids, 1993; Madjar & Shalley, 2008). In Action-Regulation Theory autonomy is seen as the most important external resource supporting individuals in dealing with regulation obstacles, such as interruptions as it “allows them to choose adequate strategies to deal with the situation, [...] they can plan ahead better and [be] more flexible in the event that something goes wrong” (Frese & Zapf, 1994, p. 319). In general, having autonomy over ones job has been shown to directly and positively impact performance (Humphrey, Nahrgang, & Morgeson, 2007; Karasek, 1979; Karasek & Theorell, 1990; Reis, Sheldon, Gable, Roscoe, & Ryan, 2000; Thompson & Prottas, 2006).

In the context of external interruptions, having low autonomy means that an employee is exposed to external interruptions and cannot anticipate or influence them. In contrast, in work environments with high autonomy, an employee experiencing cognitive fixation or being stuck during a problem-solving/planning task or creative task can initiate an internal interruption. This reduces cognitive fixation and gets unconscious processes into motion. Being able to switch tasks at ones’ own discretion and thus engaging in internal interruptions means that one can control task scheduling and task execution, which allows a more self-determined workflow. As internal interruptions can be integrated into the action plan, they support goal achievement and do not negatively impact the overall action plan. Therefore, internal interruptions can be used as a strategy because employees can initiate them at the right time to utilize incubation effects in the most effective way as proposed by previous research (Dijksterhuis & Meurs, 2006; Madjar & Shalley, 2008). Finally, employees who do not have the possibility to interrupt themselves experience lower levels of task autonomy compared to employees who are able to

do so, but still do not have to handle external interruptions which would negatively impact performance compared to non-interruptions. Therefore, work environments where employees can engage in internal interruptions can be described as work environments with higher levels of task autonomy, while external interruptions indicate lower levels of task autonomy compared to environments without interruptions. Further, task autonomy benefits performance through a motivational process (Ryan & Deci, 2000). It has been shown that high levels of autonomy can increase motivation which in turn positively impacts performance (Langfred & Moye, 2004).

In line with our reasoning above, we expect the type of interruption to not only affect performance but additionally the level of task autonomy individuals' experiences during task execution as a result. We thus propose that:

Hypothesis 3. An internal interruption leads to higher perceived task autonomy compared with (a) an external interruption and (b) no interruption; and an external interruption leads to lower perceived task autonomy compared with (a) an internal interruption and (b) no interruption.

In the first experiment, we test Hypothesis 1a and Hypothesis 2. In the second experiment, we test Hypothesis 1b as well as Hypothesis 2 and 3 and thus contrast the two alternative processes by assessing both energy and perceived autonomy after task completion. Moreover, we aim to test our assumption that internal interruptions improve performance with a different performance outcome in our second experiment.

5.2 Method Study 3a

In our first experiment, we chose a creative task because a significant percentage of knowledge worker tasks can be defined as creative tasks and creative performance is highly relevant for organisational success (for reviews, see Hennessey & Amabile, 2010; Zhou & Hoever, 2014).

5.2.1 Participants

The sample included 134 student participants ($M = 25.49$ years, 64 women) from diverse courses of studies, including education (21.2 percent), business studies (18.2 percent), social sciences (16.1 percent), psychology (15.3 percent), natural sciences / computer science (13.9 percent), humanities (2.2 percent) and law (2.2 percent). Participants were randomly assigned to the experimental conditions of a 3 (interruption: internal vs. external vs. no) x 1 factorial design. Females and males were randomly assigned to the conditions, with an equal number of males and females in the internal interruption group (17 women and 18 men), slightly more women in the external interruption group (27 women vs 21 men), and more men in the control group (31 men vs 20 women). Participants received a snack and the opportunity to participate in a raffle for 25€ book vouchers.

5.2.2 Procedure

Participants took part in the experiment on a drop-by basis. Upon arrival, student assistants seated each participant in front of a computer and opened an online questionnaire, starting with written instructions for the overall procedure and the creative task. Participants learned that they would work on two tasks for 13 minutes, a 10-minute creative task, as well as a non-specified secondary task for 3 minutes. Participants in the external interruption group were informed that they would be redirected to the secondary task at a certain time and would have to finish this secondary task before being redirected back to the creative task. Participants in the internal interruption group were informed that they needed to switch to the secondary task during the 10-minute period but could choose a time to work on the secondary task themselves and would finish the creative task afterwards. In the control group participants were simply informed that they would first work on a creative task for 10 minutes and would afterwards work on a second task. In all conditions the procedure was presented as advantageous for performance. After the instruction and filling out the questionnaire,

participants started to work on the creative task. Depending on the experimental condition the further procedures varied (see Figure 1) but all participants had 13 minutes to complete both tasks. Participants in the external interruption group were automatically redirected to the secondary task (solving math problems) after five minutes. Participants in the internal interruption condition could choose when to switch to the second task themselves. Both groups were automatically redirected back to the primary task after working on the secondary task for three minutes. Participants in the control group worked on the primary task for ten minutes and afterwards were redirected to the secondary task (see Figure 1).

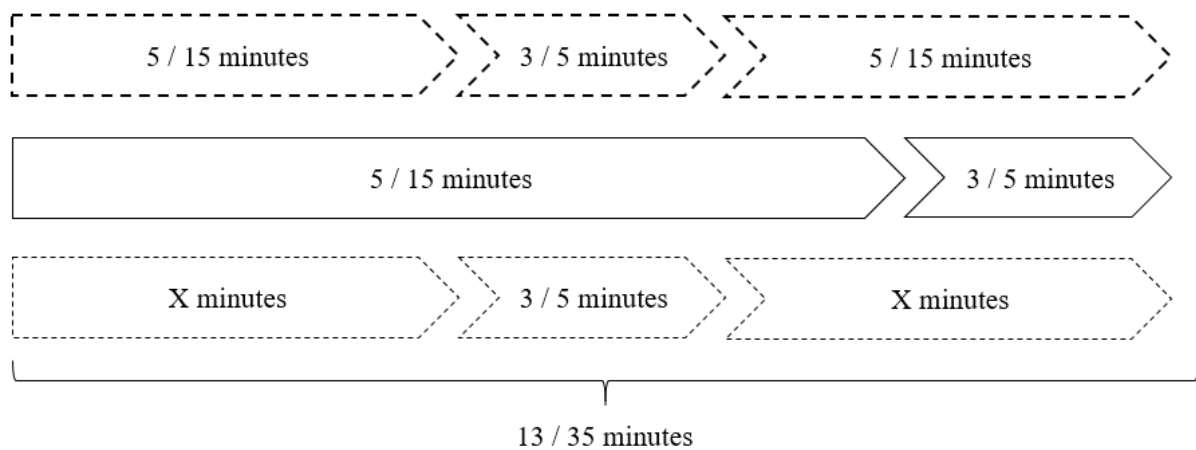


Figure 6. Procedure of study 3a.

Note. Study 1 (listed first); Study 2 (listed second). Fat dashed line = External interruption group, solid line = Control group, dashed line = Internal interruption group.

5.2.3 Creative Task (Primary Task)

The creative task is part of the well-established test for diagnosis of job-related creativity (Diagnose berufsbezogener Kreativität) by Schuler, Gelléri, Winzen, and Görlich (2013). During the task, participants were asked to make up as many games as possible for a children's birthday party with 24 listed objects. Two example games were given (a hockey match with two benches as goals and a can of soda as a ball; the game "hit the pot" using a stick and a soda can as the pot). As an indicator for creative fluency we followed the approach recommended in the test manual by counting the number of games participants developed as a

performance indicator. We also measured the originality of ideas by following the procedure outlined in the manual (also called “output dominance”, Kaufman & Sternberg, 2010), indicating how common a given response is in the entire set of responses. To do so, a naïve coder, who was blind to the study preconditions and experimental conditions, counted the number of times a specific game was mentioned. The coder then divided the games into quartiles according to the quantity they were mentioned. Following this, the coder assigned points to each game depending on its rarity, with games that were mentioned less often earning higher points. The 25% of games that were mentioned least often were assigned one point, the next 25% 0.75 points, and so forth. As the approach is objectively and rational, only one coder coded the data.

5.2.4 Math Task (Secondary Task)

The math task we used as the secondary task is part of a short German intelligence test, the Intelligenz-Struktur-Test Screening (Intelligence Structure Test Screening) (IST-Screening) (Liepmann, Beauducel, Brocke, & Nettelnstroth, 2012). The IST-Screening is a short version of the well-established German Intelligenz-Struktur Test (Intelligence Structure Test) 2000 R (Liepmann, Beauducel, Brocke, & Amthauer, 2007). In the IST-Screening numerical reasoning is tested with a numerical series task. For this task, participants were asked to continue up to 20 numerical series that were each structured according to a specific rule. As the numerical task did not require participants to coordinate multiple rules or pieces of information, we assume that the task was demanding but less complex than the primary task.

For each correct number participants received one point resulting in a maximum performance of 20 points.

5.2.5 Measures

Motivation. We measured motivation before the creative task with the German version of the fifteen-item Questionnaire on Current Motivation (QCM) developed by Rheinberg,

Vollmeyer, and Burns (2001) to measure current motivation in learning situations and adapted the items to refer to the creative task. Participants responded on a Likert-type rating scale ranging from 1 *does not apply at all* to 7 *applies fully*. A sample item for this scale is: “I am eager to see how I will perform in the creative task”. Average reliability was $\alpha = .71$.

Energy. To measure energy, we used the six-item version of the subjective vitality scale by Ryan and Frederick (1997). We assessed vitality before and after participants completed both tasks. Item target momentary feelings of vitality on a 7-point Likert scale ranging from 1 *does not apply at all* to 7 *applies fully*. An example item is: "I feel alive and vital". The scale showed good reliability (t1: $\alpha = .81$; t2 $\alpha = .89$).

5.3 Results Study 3a

Table 1 displays the means and standard deviations of all measured variables, separately for the three conditions.

Table 13
Between-Group Comparison Summary Study 3a

Variable	Control group	External	Internal
		Interruption Group	Interruption Group
Gender	n (female)	20	17
	n (male)	31	18
Age	25.04 (6.36)	26.52 (6.89)	24.71 (2.89)
Creative performance (fluency)	7.20 (2.98)	7.48 (3.01)	8.40 (3.28)
Creative performance (originality)	.15 (.08)	.16 (.07)	.19 (.09)
Math performance	5.87 (3.00)	5.24 (2.64)	4.97 (2.04)
Motivation (t1)	4.83 (.58)	4.79 (.59)	4.83 (.58)
Vitality (t1)	4.39 (.81)	4.44 (1.06)	4.46 (.96)
Vitality (t2)	4.14 (1.12)	4.29 (1.19)	4.46 (1.28)

Note. $N(\text{control group}) = 51$, $N(\text{external interruption}) = 48$, $N(\text{internal interruption}) = 35$.

5.3.1 Test of Hypotheses

Analysis of variance (ANOVA) with additional contrast analysis were used to test Hypothesis 1a. A repeated measures ANOVA was used to test Hypothesis 2.

Hypothesis 1a proposes that external interruptions will lead to decreased creative performance when compared with internal interruptions and increased performance when compared with no interruptions. Moreover, Hypothesis 1a proposes that internal interruptions will lead to improved performance when compared with external interruptions and no interruptions. For the fluency measure, we first conducted a 1 x 3 (internal, external or no interruption) ANOVA to test differences between the experimental groups. The analysis

revealed no significant overall effect of the interruption manipulation $F(2, 131)=1.66, p = 1.93, \eta^2_p = .025$ between the three groups. Still, contrast analysis revealed that fluency in the external interruption group was not significantly different from the control group ($M_{EXTERNAL} = 7.48, SD = 3.01, M_{CONTROL} = 7.20, SD = 2.98; t(131) = .458, p = .32$), and the internal interruption group ($M_{INTERNAL} = 8.43, SD = 3.28; t(131) = 1.35, p = .09$). However, there was a statistically significant difference in fluency between the internal interruption group and the control group, $t(131) = 1.79, p < .05$. Additionally, we conducted an ANOVA test for originality. The analysis revealed no significant overall effect of the interruption manipulation $F(2, 131)=2.44, p = .09, \eta^2_p = .036$ between the three groups. Still, contrast analysis revealed that originality in the external interruption group was not significantly different from the control group ($M_{EXTERNAL} = .16, SD = .07, M_{CONTROL} = .15, SD = .075; t(131) = .35, p = .37$), but significantly different from the internal interruption group ($M_{INTERNAL} = .19, SD = .09; t(131) = 1.76, p < .05$). Again, there was a statistically significant difference in originality between the internal interruption group and the control group, $t(131) = 2.1, p < .05$.

Taken together, we find only partial evidence for our first hypothesis, as participant in the external interruption group did only perform worse than participants in the internal interruption group in one performance measure (originality) but not in the other. Moreover, while they tended to perform better than participants in the control group, the difference was not statistically significant. Further, participants in the internal interruption group performed significantly better than participants in the control group for both performance measures, supporting our hypothesis that interrupting oneself leads to better performance outcomes.

Hypothesis 2 proposes that energy after task completion is lowest in the external interruption group and highest in the internal interruption group. We performed a repeated measures ANOVA with baseline energy before task execution as a covariate to investigate if the type of interruption (internal, external or no interruption) influenced energy after task execution. There was no significant effect of the type of interruption on energy after controlling

for the baseline level of energy, $F(2, 133) = .921, p = .40, \eta^2_p = .014$. Additional contrast analysis also did not detect differences in energy levels between the three groups. Thus, we find no support for Hypothesis 2.

5.4 Discussion Study 3a

The results of our first experiment only partly confirm our expectations and previous research. We found partial support for Hypothesis 1a stating that internal and external interruptions will boost performance in a creative task. While participants in the internal interruption group indeed performed best, the performance of participants in the external interruption group was not statistically different from the other two groups, except for originality. Here, participants performed worse than the internal interruption group. Our results also do not support Hypothesis 2. Following Madjar and Shalley (2008, p. 789) we expected individuals to switch tasks “as a way of refreshing themselves”, but we do not find an effect of the type of interruption on individuals’ energy levels. It is possible that we found no significant effect on performance for external interruptions because we interrupted participants only once during task execution. An increased number of external interruptions might reduce cognitive fixation more effectively, resulting in higher fluency and originality (Lu et al., 2017). However, other experiments also find a boost in performance if participants are only interrupted once (for a meta-analytic review see Sio & Ormerod, 2009).

Alternatively, in our experiment staying focused on the creative task might have been helpful for performance. On the one hand ideas can be generated by switching between ideas and approaches and by exploring distant ideas (Nijstad, Dreu, Rietzschel, & Baas, 2010) as this reduces cognitive fixation (Lu et al., 2017). On the other hand, Nijstad et al. (2010) argue that a “systematic and effortful exploration of possibilities, and in-depth exploration of only a few categories or perspectives” (p.44) can also generate creative outcomes. In our experiment, both pathways could have been used to generate ideas. This might explain why we found no

performance differences between the control group and the external interruption group as the external interruption group could generate games by using the first pathway, while the control group could generate ideas using the focused process, resulting in an equal creative performance. Since participants in the internal interruption group were additionally able to switch tasks at opportune moments, they could utilize both pathways depending on their perceived utility, for example by choosing a longer focused period in the beginning and switching to the secondary task when this pathway did not result in the generation of more games. Moreover, switching costs were lower in this group, resulting in better performance than in the control group for both performance measures.

After conducting the first study, the impact of internal interruptions compared to external interruptions remains inconclusive. Even though we found no differences in energy levels after task completion for the three groups, we explore the motivational pathway alongside the energy management pathway in our second experiment. As planned, we chose a complex planning task for our second experiment since a) performance on planning tasks is important in most knowledge worker jobs and b) external interruptions should be more disruptive in tasks with a high level of complexity (Adler & Benbunan-Fich, 2015).

5.5 Method Study 3b

5.5.1 Participants

The sample included 223 student participants ($M = 23.66$ years, 110 women) from diverse courses of studies, including natural sciences / computer science (28 percent), social sciences (17.8 percent), business studies (16.5 percent), law (11.9 percent), education (11 percent), psychology (7.2 percent) and others (7.5 percent). Participants were randomly assigned to the three experimental conditions (interruption: internal vs. external vs. no). Females and males were randomly distributed across conditions, with a nearly equal number of

males and females in most of the groups and slightly more men in the control group (35 men vs 26 women). Participants received six Euros reward for their participation.

5.5.2 Procedure

The procedure of experiment two is equal to our first experiment. Only a few modifications were applied. The time changed from 13 to 35 minutes which was equally instructed as in experiment one. Participants had 30 minutes to complete the planning task and 5 minutes to complete the secondary task (see Figure 1). Additionally, participants within the two experimental conditions were instructed that an auditive signal (beep) indicated that they needed to switch back to the planning task after the second task. Again, in all conditions the procedure was presented as advantageous for performance. This way we tried to persuade participants to follow the instructions properly. After completing both tasks participants answered a second questionnaire assessing not only the perceived difficulty of both tasks, and the vitality scale for a second time but also the perceived autonomy during task execution.

5.5.3 Primary and Secondary Task

Participants worked on a planning task which required the coordination of different tasks on a fictitious working day (a so-called plan-a-day task; Funke & Krüger, 1995). First, participants received a separate instruction listing the tasks they needed to do and a plan with the time it would take to complete each task and to travel between different locations. In addition, the instruction mentioned that some tasks could only be completed at a certain time of the day (e. g. a doctors' appointment). To complete all tasks, a critical component of planning was the consideration of travel times between locations. Specifically, participants needed to identify that the key task was to repair a scooter at a repair and assembling shop as this shortened the time needed for subsequent travel to a third. The participants were asked to write down the order in which they would execute the tasks and when each task would be completed. To solve the planning task, participants needed to apply forward thinking and decision-making skills. To

rate performance within the planning task, two naïve coders assigned points for each correct planning step of the task based on a predetermined coding scheme. Extra points were assigned for correctly identifying the crucial aspect of the planning task, the necessary repair of a fictitious scooter. To determine consistency among raters we performed interrater reliability analysis which was high with Kappa = .95 ($p < 0.001$), 95% CI (0.82, 0.99).

The secondary task was a formatting task in Windows PowerPoint. Participants opened an existing PowerPoint presentation and were asked to correct existing errors following set rules (e.g. all headings big and centered in the middle).

5.5.4 Measures

Motivation and Energy. We used the same questionnaires as in our first experiment. Reliability was satisfactory ($\alpha = .72$) for motivation and excellent for energy (t1: $\alpha = .90$; t2 $\alpha = .91$).

Autonomy. To measure autonomy, we used an adapted version of the autonomy scale of the German ISTA (Instrument for Stress-related Job Analysis) by Semmer, Zapf, and Dunckel (1999). The adapted measure consists of four items that refer to the degree of autonomy participants perceived to have on the way and methods of doing the two experimental tasks (sample item: “Could you influence the way of how you accomplished the tasks?”). Of the five original ISTA items, one was not applicable to the specific context of the experiment and was thus excluded. Items were rated on a 5-point Likert scale ranging from 1 *very little* to 5 *very much*. Analysis showed an acceptable reliability of $\alpha = .67$.

5.6 Results Study 3b

Table 12 displays the means and standard deviations of all measured variables, separated by condition.

Table 14
Between-Group Comparison Summary Study 3b

Variable	Control group	External Interruption Group	Internal Interruption Group
Gender	n (female)	26	46
	n (male)	35	42
Age	23.03 (3.24)	23.84 (3.85)	23.84 (4.01)
Planning performance (quant)	18.67 (7.74)	17.02 (7.85)	20.85 (7.07)
Formatting performance	44.09 (28.24)	43.98 (26.55)	43.83 (29.00)
Motivation (t1)	3.93 (.69)	3.92 (.55)	3.93 (.55)
Task autonomy	2.94 (.73)	2.78 (.74)	3.14 (.75)
Vitality (t1)	4.43 (1.28)	4.24 (1.14)	4.37 (1.20)
Vitality (t2)	4.28 (1.26)	4.16 (1.23)	4.38 (1.15)

Note. $N(\text{control group}) = 61$, $N(\text{external interruption}) = 84$, $N(\text{internal interruption}) = 88$.

5.6.1 Test of Hypotheses

Analyses of variance (ANOVA) with additional contrast analyses were used to test Hypothesis 1b and 3. To test Hypothesis 2 we used repeated measures ANOVA.

Hypothesis 1b proposes that being interrupted internally will lead to improved performance on a planning task when compared with being interrupted externally and working on the task uninterrupted. Further, Hypothesis 1b assumes that being interrupted externally will lead to the worst performance on the planning task. To test Hypothesis 1b, we first conducted a 1 x 3 (internal, external, no interruption) ANOVA to test differences in planning performance. The analysis showed a significant overall effect $F(2, 230)=5.58$, $p < .01$, $\eta^2_p=.046$ between the groups. Additionally, contrast analysis revealed that participants within the internal interruption

group ($M_{INTERNAL} = 20.85$, $SD = 7.07$) performed significantly better than participants in both the external interruption group ($M_{EXTERNAL} = 17.02$, $SD = 7.85$; $t(230) = -3.33$, $p < .01$) and the control group ($M_{CONTROL} = 18.67$, $SD = 7.74$; $t(230) = 1.74$, $p < .05$). Further, the external interruption group performed worst, but not significantly worse than the control group ($t(230) = 1.3$, $p = .10$). In summary, we again find partial evidence for Hypothesis 1b, as the internal interruption group performed significantly better than the other two groups, thus supporting our assumption that interrupting yourself improves performance. However, the external interruption group did not perform worse than the control group. Hence, being confronted with an external interruption did not interfere with performance.

Hypothesis 2 states that compared to the other two groups energy after finishing the two tasks will be lowest in the external interruption group and highest in the internal interruption group. Again, we performed a repeated measures ANOVA with baseline energy before task execution as a covariate to investigate if the type of interruption (internal, external or no interruption) influenced energy after task execution. There was no significant effect of the type of interruption on energy after controlling for the baseline level of energy, $F(2, 223) = .383$, $p = .68$, $\eta^2_p = .003$. Thus, we again find no support for Hypothesis 2.

Hypothesis 3 assumes that participants in the internal interruption group will experience higher task autonomy than participants in the two other groups. We again tested this hypothesis using a 1 x 3 ANOVA with added contrast analyses. The results of the ANOVA indicated that perceived autonomy between groups varied significantly $F(2, 230) = 4.90$, $p < .01$, $\eta^2_p = .042$ with highest autonomy for the internal interruption group ($M = 3.14$, $SD = .75$), lowest autonomy for the external interruption group ($M = 2.78$, $SD = .74$) and perceived task autonomy in the control group in between ($M = 2.94$, $SD = .73$). Contrast analyses revealed a significant difference in task autonomy between the internal interruption and the external interruption conditions, $t(223) = -3.13$, $p < .01$, but no differences between the internal interruption group

and the control group ($t(223) = 1.57, p = .06$) and the external interruption group and the control group ($t(223) = 1.23, p = .11$).

5.7 Discussion Study 3b

Again, the results of our second experiment only partly confirm our expectations. We found partial support for our first hypothesis stating that internal interruptions will boost performance whereas external interruptions will decrease performance on a planning task. While participants in the internal interruption group indeed performed better than the two other groups, the performance of the external interruption group was not statistically worse than that of the control group.

Further, we find no support for our second hypothesis. No differences in energy levels after task completion emerged between groups. Instead, the internal interruption group reports significantly higher task autonomy than the external interruption group which reports lowest task autonomy among the three groups. Thus, the results partly support our third hypothesis.

As Hypothesis 1b is supported by our results, external interruptions seem intrusive when it comes to planning tasks, which is in line with previous research. Thus, external interruptions do not have the same improving impact on planning performance as on creative performance. Nevertheless, we assume the negative effects of external interruptions are counteracted by a positive incubation effect on the decision-making part of the task, thereby achieving a similar performance as the control group. Contrastingly, the internal interruption group not only benefited from an incubation effect but also from the favourable timepoint of the interruption.

We again found no differences in energy levels after task completion, therefore we reject Hypothesis 2. Moreover, the support for Hypothesis 3 indicates that the mechanism by which internal interruptions boost performance can be attributed to the increase in task autonomy.

5.8 General Discussion

The main purpose of this study was to examine if internal and external interruptions affect performance in different ways. In two laboratory experiments we found that internal interruptions boosted performance in both a creative task and a planning task.

Moreover, this beneficial effect seems to be due to higher levels of task autonomy, but not energy, supporting the view that effects are mediated by the level of autonomy. Our findings that performance can benefit from interrupting oneself are in line with conclusions drawn from ART (Frese & Zapf, 1994; Hacker, 1973, 2003, 2005). However, for external interruptions contrary to our expectations and past research (e.g., Baethge & Rigotti, 2013; Bailey & Konstan, 2006), we did neither find an increase in performance for the creative task, nor a significant decrease in performance for the planning task when compared to the performance in the control group, a finding which we will explain below.

5.8.1 Theoretical Contributions

The present research contributes to the literature in several ways. First, it directly compares the effects of internal and external interruptions and demonstrates a positive impact of internal interruptions on creative performance and planning performance. Previous studies did mostly comment on internal interruptions on a conceptual level (e.g. Jett & George, 2003) but did not investigate the actual consequences of initiating an internal interruption. Our results indicate that internal interruptions differ from external interruptions in their impact on task performance and task autonomy. Contrary to external interruptions, internal interruptions consistently boost performance and increase task autonomy. Based on this, recommendations from past research that favour uninterrupted work on one task (Adler & Benbunan-Fich, 2013) cannot be extended to internal interruptions. Taken together, the results from our study indicate that findings from research on external interruptions cannot be transferred to internal interruptions as the effects are divergent. Consequently, it needs to be clarified that current

research on interruptions only applies to external interruptions. Further, internal interruptions need to be integrated into research on multitasking and interruptions as a distinct concept. Moreover, it is likely that internal interruptions also have an impact on other work-related outcomes (e.g. self-efficacy, job satisfaction, motivation) which is also expected by Madjar and Shalley (2008).

Second, our study is first to integrate internal interruptions into a theoretical framework by drawing on Action-Regulation Theory (Frese & Zapf, 1994; Hacker, 1973, 2003, 2005) as well as research on energy management (Fritz et al., 2011; Zacher et al., 2014) and task autonomy (Humphrey et al., 2007). We proposed that internal interruptions can be integrated into the action plan and can thus not be classified as regulation obstacles. Additionally, our results suggest that effects are mediated by the task autonomy pathway. This perspective was supported by our finding that internal interruptions lead to higher perceived task autonomy. The alternative energy pathway was not supported by our data as we find no support for earlier assumptions that internal interruptions replenish energy resources (Madjar & Shalley, 2008). Thus, our research thereby extends earlier conceptual frameworks by Adler and Benbunan-Fich (2015) and Jett and George (2003) by offering a theory-based explanation and providing empirical insight into the process by which internal interruptions influence performance.

Third, we focus on only one interruption of the primary task within our experiments. Previous work comparing internally and externally determined task switches prescribed the number of external interruptions, but did not control these parameters for internal interruptions, resulting in a different amount of task switches in both conditions (Lu et al., 2017; Madjar & Shalley, 2008). By keeping the number of interruptions constant, we can ascribe the boost in performance and perceived task autonomy to the difference between internal and external interruptions, which improves the validity of our findings. Moreover, focusing on the impact on only one external or internal interruption is important to allow for a consideration of the conceptual differences that determine the impact of the interruption. Nevertheless, multiple

external interruptions are thought to have a qualitatively different impact than a single external interruption (Baethge et al., 2015) which is likely true for internal interruptions as well.

5.8.2 Practical Implications

Our research also contributes to practice. Past research has consistently favoured uninterrupted work (Adler & Benbunan-Fich, 2013). However, in a day and age when a growing amount of knowledge work is tied to ICT it becomes increasingly difficult to follow this advice. Based on this study we recommend, that employees should be able to interrupt themselves and switch to a second task in a self-determined way, for example when they are stuck or overwhelmed, and return to the first task after some time spent on the second task. This not only improves performance on the first task, our approach is also more compatible with the demands from today's knowledge work and thus might be easier to follow. Thus, we recommend that organisational policies and work design recommendations consider this advice and prompt employees to determine their workflow in a fashion that suits their needs and preferences, specifically when working on tasks that require some degree of creative thought. While we did not find a negative effect on performance of being externally interrupted once, this finding should not be overestimated. Being externally interrupted, especially when external interruptions accumulate (Baethge et al., 2015), is still mostly associated with negative performance and well-being outcomes.

5.8.3 Limitations

Since external and internal interruptions are highly relevant characteristics of modern knowledge work, it is important to further our understanding of their impact on performance. The present experiments are helpful in this regard, but, of course, have certain limitations. First, our results stem from two laboratory experiments that only assessed performance on two relatively short primary tasks (Study 1: 10 minutes; Study 2: 30 minutes) and only for a single external or internal interruption. We do not know the extent to which the effects of both types

of interruptions can be generalized for longer tasks and for multiple interruptions, though both are typical for knowledge work. For external interruptions Baethge et al. (2015) provide insight into the accumulating negative effect of multiple interruptions. In a similar fashion, multiple internal interruptions might be qualitatively different from a single internal interruption.

A second limitation is that we measured our proclaimed mediating variables, energy and perceived autonomy, after task completion. Participants might have inferred their level of energy and perceived autonomy from their self-perceptions of performance. Assessing the mediating variables while participants were working on the tasks without interrupting them further is difficult with an approach based on self-report questionnaires. In a similar fashion, it is also possible that the used measurement technique might explain the missing support for the energy management process. Participants might not have access to introspective insights for fine-tuned changes in inner states (Wilson & Dunn, 2004) or might fall victim to self-presentation tendencies (Silvia & Gendolla, 2001) that could explain the non-significant effect of interruptions on energy levels. Future studies should consider alternative, less disruptive ways to measure these mediators.

Third, internal interruptions and task switching are closely related. While task switching is often investigated with a rather cognitive approach (Kiesel et al., 2010) we decided to base our assumptions primarily on ART. Based on this we did not consider important aspects of the cognitive approach (e.g. working memory) in our study. As a consequence, we cannot integrate our findings into the research on task switching that draws upon a cognitive approach yet.

Finally, we used a student sample in both experiments. Thus, we cannot be sure if our findings are transferrable to an organisational context. While it is difficult to perform experimental studies in an organisational setting, future research should try to investigate the impact of internal interruptions on organisational performance with field experiments and alternative designs. For example, it could also be informative to closely examine the effects of internal interruptions on daily work with an experience sampling design.

5.8.4 Directions for Future Research

Contrary to our expectations and past research external interruptions did not have a negative impact on planning performance. Our framing of the external interruption as positively impacting performance might have influenced participants perceptions of being interrupted. For this reason, while external interruptions did not positively affect performance due to their function as a regulation obstacle the expectation that the task switch would boost performance might have reduced their disruptive effect as they were not seen as something inherently negative. Future research should investigate directly if framing an external interruption in a positive light can alleviate their negative consequences.

Additionally, similarly to external interruptions (Baethge et al., 2015) the frequency of internal interruptions might affect their impact. We suggest that there might be an optimal frequency for interruptions which should be investigated by future research.

Further, we did not integrate other moderating factors into our framework. Still, some aspects (e.g. self-efficacy) might have an impact on the observed effects. Task autonomy as proxy of internal interruptions might harm performance when employees are not familiar with a highly complex task resulting in low self-efficacy but can also boost performance when high self-efficacy is observed (Madjar & Shalley, 2008). Additional research is needed within this field to explore more relations and boundary mechanism.

To assess energy without creating additional demands and increasing validity as discussed earlier, future studies should consider physiological measurements. This might be a promising approach within future studies to achieve not only a less disruptive way to measure mediators, but also to gather valid data on energy levels and general cognitive activity in real time.

5.9 Conclusion

In conclusion, our study provides a theoretical framework that accounts for divergent effects of internal and external interruptions, namely Action-Regulation Theory and a task autonomy process. We were able to demonstrate their positive influence on two different performance outcomes. We also extend our understanding on the underlying processes, by assessing energy and autonomy as mediating variables. We conclude that being able to interrupt oneself serves as a proxy for high task autonomy and thus leads to positive performance outcomes. By demonstrating the positive impact of internal interruptions on performance, we show that the common advice to focus on one task at a time might be misguided. Instead, switching between different tasks at ones' own discretion might not only be more representative of modern knowledge work, but also more beneficial for task performance.

6 General Discussion

Throughout recent decades, organisational researchers showed increasing interest in multitasking at work. For one, the significant changes in our work life led to more multitasking behaviour and in addition, we now know that multitasking strongly influences employee performance and well-being (Zimber & Rigotti, 2015). The link between multitasking and performance and well-being was mostly shown to be negative (Adler & Benbunan-Fich, 2012; González & Mark, 2004; Salvucci, 2005). However, there are inconsistent findings on multitasking caused by internal interruptions that are based on very few studies (Adler & Benbunan-Fich, 2013; Katidioti et al., 2016). I question if the current literature reflects on all relevant aspects of interruptions or if there are parts that have been neglected thus far. Throughout this dissertation, I explore an important facet of multitasking behaviour and provide novel insights to the conceptualisation of internal interruptions. To do this, I chose an integrative framework that connects internal interruptions to human energy, a personal resource that constitutes part of resources research as another important research field in organisational psychology (Bakker & Demerouti, 2007; Hobfoll et al., 2018). This approach helps to understand why people interrupt themselves at work and to discover the underlying processes of internal interruptions. In order to better understand internal interruptions as part of multitasking, I embedded internal interruptions into conceptual models (Brixey et al., 2007) and built upon theories (e.g. Action-Regulation-Theory, Conservation of Resources theory). In turn, the presented studies help to build a comprehensive understanding of internal interruptions and thereby enhance the current understanding of multitasking as a phenomenon.

The three parts of this dissertation differentially contribute to the literature however, when considered simultaneously; they also provide novel and valuable insights. Firstly, the results suggest that human energy indeed suffers from a jangle fallacy and can be successfully linked to internal interruptions. Knowledge gained from study 1 and 2 together suggest that, the

approach to include human energy into the multitasking research in general is important. However, the results show no long-term relationships between internal interruptions and human energy. But when integrating other factors (e.g. job autonomy or the reasons why people interrupt themselves), the relationship becomes evident. Thus, in general internal interruptions do not function as energy management strategy but can improve human energy when other factors are considered (e.g. job resources). Moreover, this dissertation showed that internal interruptions, compared to no interruptions or external interruptions, consistently improve performance in planning tasks. The different reasons as well as the different effects of internal interruptions point out that the distinction between internal interruptions and external interruptions in multitasking research is crucial for understanding human behaviour at work. Overall, the results do not support previous assumptions that multitasking in general is bad for well-being and performance. I will now discuss the results in more depth. After summarizing the main results of the presented studies, and emphasising the contribution to research and practice, the limitations are discussed and suggestions for future research are derived.

6.1 Main Findings and Theoretical Contribution

First, I discuss the main findings and their contribution to the literature on internal interruptions in particular and on multitasking in a broader perspective. Specifically, I start by discussing the results on the pre-conditions and reasons for internal interruptions (6.1.1). The next section considers the underlying processes of internal interruptions in more depth (6.1.2) which is followed by a broader perspective on multitasking in general and their impact on performance at work (6.1.3).

6.1.1 Why do we Interrupt Ourselves?

Thus far, research struggled to identify which conditions prevent and which conditions lead to internal interruptions in real work settings (Adler & Benbunan-Fich, 2013, 2015; González & Mark, 2004). However, research indicated some conditions (e.g. being stuck at a

task, being frustrated, boredom or routine behaviour) with the help of experimental studies and thereby established a foundation to build on and further develop in a setting closer to real work (Adler & Benbunan-Fich, 2013; Fisher, 1998; Jin & Dabbish, 2009; Payne et al., 2007). Adler and Benbunan-Fich (2015) highlight, that especially research on internal interruptions can benefit multitasking research, as it is important to integrate these components into more elaborate multitasking research based on external interruptions. This dissertation goes beyond previous knowledge by investigating the phenomenon of internal interruptions in real-work settings. Thus, it increases the understanding of conditions for internal interruptions at work, which helps to understand the functioning of multitasking.

6.1.1.1 Human Energy – a Resource that Prevents Internal Interruptions

For one, this dissertation uncovers human energy as a personal resource that can help an employee to focus on their work, which is contrary to multitasking behaviour. The results of study 1 provide a nomological network of human energy. The nomological network respects the need for parsimony in research and thereby advances earlier research. It shows that human energy is positively related to commitment, well-being and performance. Moreover, human energy is likely to increase motivation (Seo et al., 2004). Building on the results human energy can be described as a volatile personal resource that helps employees to achieve their objectives and protects them from possible threats as well as negative experiences. When considering human energy as a condition that is related to commitment as well as motivation, it is more likely that human energy leads to focused work instead of interruptions. Commitment and motivation positively strengthen an employees' wish to successfully accomplish tasks and broader work objectives (Reijseger et al., 2016) and thereby decrease internal interruptions. Taken together, the results support the idea of human energy being a precondition of focused work or differently said, that human energy decreases the likelihood of internal interruptions and thereby of self-started multitasking at work. In addition to this rather theoretical approach, the results indicate a short-term relationship between human energy and internal interruptions

but no long-term relation. Individuals named exhaustion, boredom or feeling tired as a reason to interrupt oneself which are stated that negatively relate to human energy and the studies observed a short-term link between having low levels of human energy and internal interruptions. Evaluating those facts together leads to the conclusion that lower levels of energy can be beneficial for internal interruptions in a short period of time. This conclusion links two important research areas with one another, namely research on personal resources and multitasking research and gives a new perspective on multitasking behaviour as it identifies possible mechanisms besides previous cognitive and neuropsychological research (Adler & Benbunan-Fich, 2015; Baethge & Rigotti, 2013; Salvucci, 2005; Zimmer & Rigotti, 2015). In sum, we now know that multitasking behaviour that is caused by the individual itself is highly dependent on affective states and the resources available, when observed in a real-work setting and not only in experimental settings (Adler & Benbunan-Fich, 2013).

6.1.1.2 Situational and Work-Design Conditions Fostering Internal Interruptions

Unlike human energy as a personal resource, there are conditions that can increase internal interruptions. On the one hand, the studies' results support previous findings by identifying that internal interruptions occur more often when tasks are boring or too difficult (Adler & Benbunan-Fich, 2013; Payne et al., 2007). On the other hand, employees describe situations in which they do not interrupt themselves as more intellectually stimulating and dutiful (e.g. other people are dependent on the employees' success). Thus, focused work, as opposed to internal interruptions, is more likely when individuals perceive a person-task fit (e.g. when the skills/interests of the person meet the requirements of the tasks). Moreover, when individuals experience meaning in tasks, they will interrupt themselves less, which is similar to earlier findings regarding job characteristics (Demerouti et al., 2012; van den Broeck, Vansteenkiste, Witte, & Lens, 2008). Besides those factors that are dependent on the employee and their capabilities, this dissertation provides information on additional relevant characteristics. The situation in which an employee is currently working appears to be relevant.

The studies 2a and 2b show that most internal interruptions occur because the employee has too many parallel tasks to accomplish at work. Thus, in line with previous research (Zimber & Rigotti, 2015), it appears that increased work demands are highly important for self-induced multitasking behaviours, hinting towards impaired interpretability of experimental settings, as those have not reflected the high workload so far (Adler & Benbunan-Fich, 2013; Jin & Dabbish, 2009; Payne et al., 2007). Besides the prominent result that high workload increases internal interruptions, the results also show that the reasons for internal interruptions vary across a workday. For example, employees frequently report boredom as a reason to interrupt themselves during the morning but not feeling tired, which is named frequently in the afternoon. Hence, internal interruptions that are observed during the first half of the workday result out of different reasons than internal interruptions that are observed in the second half of the day. This differentiation is crucial for the observed effects and highlights the importance to observe specific phenomena according to their appearance. Thus, this dissertation shows that research on employee behaviour is neither independent of the daytime nor of the affective experiences of the employee.

Taken together, this dissertation emphasises the diversity of reasons and situations in which employees interrupt themselves during work. The reasons go beyond previously identified reasons and integrate situational characteristics that are equally relevant for internal interruptions as affective experiences. In addition, the studies show that it is important to respect the fluctuation of affective states during a workday, as they highly influence employee behaviour at work and thus cannot be generated across different times. All in all, the mix of the first three studies helped to identify situational characteristics, affective states as well as personal resources to be relevant for internal interruptions in real work settings. Thereby they built a foundation to develop theoretical assumptions on how internal interruptions can be strategically useful, especially with regard to human energy as personal resource.

6.1.2 Can we use Internal Interruptions Strategically?

Besides investigating the reasons for internal interruptions at work, this dissertation aimed at shedding light on the underlying processes of internal interruptions. In particular I considered the strategic use of internal interruptions and thereby identified a way to explain how interruptions may affect work outcomes. The dissertation built upon the idea that human energy is closely related to uninterrupted work, and moreover extended the view of internal interruptions from something that is more or less under the control of the employee (Baethge et al., 2015; Jett & George, 2003) to a possible strategy that employees can use to manage their energy resources. Moreover, the insight that having job autonomy strengthens the negative effect of human energy on the number of interruptions broadens the perspective on resources in the interruption framework. This highlights the importance of job characteristics as mentioned in previous research but has not been linked to the interruption framework (Bakker & Demerouti, 2007; Brixey et al., 2007).

Contrary to the expectations, that there indeed is an underlying energy management strategy, the results did not support the existence of causal relations between internal interruptions and human energy. Additionally, the number of interruptions did not significantly increase when human energy was low at an earlier time point, nor did human energy improve when employees interrupted themselves. Thus, the results do not support our assumption of a strategic use of internal interruptions when it comes to energy management. The results also suggest that unlike external interruptions, internal interruptions do not decrease well-being (with human energy being a component of well-being) (Adler & Benbunan-Fich, 2013; Baethge & Rigotti, 2013; Brixey et al., 2007) as we did not observe a decrease of human energy when multiple internal interruptions occurred. Taken together, the results do not indicate a long-term relationship between human energy and internal interruptions and thus do not provide evidence that internal interruptions in general help to conserve resources. But contrasting earlier assumptions, internal interruptions do not harm human energy and thus do not result in

decreased well-being. This perspective has not been considered in research, as multitasking has mostly been linked to negative effects on well-being (Baethge & Rigotti, 2013). Thus, even though internal interruptions in general do not improve well-being, they do not harm employee well-being. However, as highlighted before, internal interruptions are complex phenomena that depend on multiple factors and thus, more factors need to be considered to understand the underlying processes of internal interruptions.

In addition to investigating the direct effect between internal interruptions and human energy from morning to afternoon and vice versa, I included job autonomy as a possible moderating variable in this framework. Contrary to the assumption that job autonomy strengthens the relationship between internal interruptions in the morning and human energy in the evening, job autonomy did not have an influence on it. Thus, job autonomy as a job resource that allows individuals to schedule their work (Humphrey et al., 2007; Morgeson & Humphrey, 2006), does not strengthen the effect internal interruptions have on human energy. Instead, having job autonomy proved to increase internal interruptions when human energy was low. Thus, job autonomy rather enables individuals to interrupt themselves in case they feel exhausted or tired. Having job autonomy therefore increases the strategic use of internal interruptions, as individuals more often choose to interrupt themselves when they experience low levels of human energy, but high levels of job autonomy. This is somewhat contrasting earlier research (Hobfoll et al., 2018), as job autonomy as a job resource itself does not help to replenish resources, but instead offers the possibility to find strategies to do so. Having job autonomy establishes the possibility to structure ones' work and thus enables multitasking when the individual feels the need to switch the activity. This dissertation supports the assumption that job autonomy is relevant for multitasking behaviour (Bachmann, Grunschel, & Fries, 2019), but that job autonomy itself only induces multitasking behaviour in the case that employees feel the need to interrupt themselves because of low levels of energy.

Besides job resources, the reasons for internal interruptions and the tasks individuals pursue during the interruption can be crucial for the strategical success of internal interruptions. Specifically, why people interrupt themselves and what they do during the interruption, is crucial in order to observe the strategic use of internal interruptions (Fritz et al., 2011; Fritz et al., 2013; Zacher et al., 2014). Our findings on why people interrupt themselves and how they use the interruption, hint towards a difference in the strategic use, and thereby point towards the relevance of considering this information. For example, employees oftentimes use internal interruptions to use their smartphone. Smartphone use however, does negatively affect well-being and consumes cognitive resources (Gökçearsan et al., 2016) and thus is probably not an efficient EMS. Conversely, employees identify feeling tired as a reason for and relaxation as a purpose of internal interruptions, especially in the afternoon which hints towards a planned strategic use of the internal interruption. Thus, even though individuals want to recover, they do not always choose the right activity to do so (e.g. an employee feels tired and wants to recover but checks his emails on the smartphone in between). Literature on micro-breaks and EMS can help to explain this discrepancy. For example Zacher et al. (2014) showed that taking a micro break (e.g. drink water or surf the web) worked as EMS whereas work-related strategies (e.g. switch to another task, check email) did not. Thus, it seems necessary to address how people use the internal interruption, to be able to observe those effects. This idea needs some further consideration. When internal interruptions are seen as changes of focus due to thought processes and physical needs (Payne et al., 2007), it is also possible that the secondary task involves work-unrelated strategies (e.g. drinking water). Those work-unrelated strategies are mostly seen as micro-breaks at work, which again work as EMS (Fritz et al., 2011). Taken together, internal interruptions can either cause micro-breaks or can be used to deal with other work-related tasks, which prove to not have the same impact on energy management (Fritz et al., 2011; Zacher et al., 2014). Thus, internal interruptions can only function as EMS under

certain circumstances (e.g. when individuals interrupt themselves because they feel exhausted and use the interruption to open the window or talk to a co-worker).

Summarizing these considerations, internal interruptions in general do not improve human energy at work and thus do not function as energy management strategies. But when integrating job characteristics as well as more information on the particular internal interruption itself, the strategic use of internal interruptions as an energy management strategy is possible. Overall, this approach linked multitasking behaviour to the resources literature as it showed that internal interruptions are not independent from personal and job resources. Moreover, these results support the need for a distinction in the multitasking research between external and internal interruptions, because so far previous research showed that interruptions negatively influence resources and well-being (Baethge & Rigotti, 2015).

6.1.3 What are the Consequences of us Interrupting Ourselves?

Another important contribution of this dissertation is the differentiation between internal and external interruptions based on their consequences for work performance. Employee work performance is important for the organisation, and the employee, (Roe, 1999) and has been of increasing interest in the multitasking research (Adler & Benbunan-Fich, 2015; Baethge & Rigotti, 2013; König et al., 2005). Besides investigating the relation between internal interruptions and human energy in the context of well-being, this dissertation connects earlier research on multitasking performance (Adler & Benbunan-Fich, 2012; González & Mark, 2004; Madjar & Shalley, 2008) to a new perspective by integrating both external and internal interruptions. Through two distinct experiments, this dissertation examined the effects of external, internal and non-interruptions on performance in two different tasks and thereby provided a broader understanding how multitasking is dependent on the interrupted tasks as well as its form (i.e. internally vs. externally caused). The results demonstrated that internal interruptions consistently improved performance compared to non-interruptions, and that

external interruptions only impair performance when interrupting planning tasks, but not when interrupting creative tasks. Moreover, the results showed that in contrast to external interruptions (Baethge & Rigotti, 2013), internal interruptions did not lead to an impairment of well-being, when examining human energy in the context of well-being. Thus, it is important to differentiate between the two types of interruptions and how they impact multitasking behaviour. Furthermore, generalising the findings of external interruptions onto internal interruptions can lead to false conclusions. Hence, when investigating multitasking behaviour, it is necessary to consider what type of interruption caused the behaviour.

However, the results are contradictory to some earlier experimental findings on internal interruptions (Katidioti et al., 2014; Katidioti et al., 2016) but have one very important methodological advantage towards earlier research. In contrast to earlier findings, the experiments control for the number of interruptions (only one external and one internal interruption), which has not been the case in earlier studies (Adler & Benbunan-Fich, 2013; Katidioti et al., 2014; Katidioti et al., 2016). Another advantage of the experiments is that the tasks used are typical knowledge worker tasks and not non-work-related games, as used in previous studies (Adler & Benbunan-Fich, 2013; Katidioti et al., 2014). Thus, this dissertation enables direct comparison between external and internal interruptions and moreover advances previous findings by increasing external validity.

Taken together, research can differentiate between external and internal interruptions, not only on the level of their causes, but also on the level of their consequences, as these studies provide information on different effects of internal interruptions on work performance and well-being unlike previous research (Adler & Benbunan-Fich, 2012; Baethge & Rigotti, 2013). This suggests that future multitasking research needs to consider this differentiation and cannot generalise findings from one form of interruption to the other. Moreover, multitasking research should not expect equal results in characteristically different tasks or jobs, because the results

underline earlier assumptions (Madjar & Shalley, 2008) that the task characteristics (creative vs. planning) influence how multitasking affects performance.

6.2 Practical Implications

This dissertation also provides some practical implications for organisations and their employees. The studies reveal that organisations need to differentiate between different types of interruptions at work. Organisations should foster an organisational climate that positively influences human energy by providing organisational support and job resources that help to build up personal resources. When employees experience high levels of personal resources, they tend to perform better, be more committed to the organisation and its objectives, and are more satisfied with their work. Thus, an environment that creates the possibility for employees to feel invigorated and vital at work, also creates the possibility for high quality performance and healthy employees. Besides feeling energetic at work, it is important to design work that reduces frustration and exhaustion, as those are two important triggers for internal interruptions. Doing work that is in line with an employees' abilities and interests increases the chance to achieve a work setting that reduces these negative experiences. Thus, a job that offers a good person-job-fit deems fruitful (Kristof-Brown, Zimmerman, & Johnson, 2005). Person-job-fit leads to experiencing more satisfaction but less frustration, and exhaustion (Kristof-Brown et al., 2005) which leads to less internal interruptions, and thus reduces multitasking behaviour. Employees still need to have the possibility to choose to interrupt themselves when they feel the need to do so. Having autonomy at work allows this and employees have the opportunity to interrupt themselves whenever they feel stuck at a task or bored, which again can help to increase work performance in different types of tasks. The ability to structure their own work environment furthermore helps employees to protect themselves from external interruptions, which has been shown to impair work performance when it comes to planning tasks. Besides the possibility to weaken the need for employees to interrupt themselves, organisations should

try to provide an environment which allows individuals to take short breaks or switch tasks when they feel that they need a brief interruption. Those interruptions can, under the right circumstances, help to improve well-being and performance, and thus are beneficial not only for the employee, but also for the organisation.

6.3 Limitations and Strengths

Similarly, to most research, this dissertation comes along with limitations but also has considerable strengths. In the following, I will discuss the three most important limitations of this dissertation, emphasising those that are relevant for the overall contribution of this dissertation. Finally, I will highlight the variety of methodological approaches used in this dissertation as an essential strength.

First, causal conclusions cannot always be derived by the study design. For example, a meta-analytic approach does not support the establishment of causal conclusions. Thus, the assumption that human energy is fostered by organisational and job resources, and in turn fosters well-being and job performance, relies on theoretical assumptions that have been derived from earlier research findings. Moreover, it is not appropriate to draw causal conclusions based on cross-sectional designs, thus we can only infer theoretically that the named personal and situational characteristics, cause internal interruptions. However, this dissertation also includes studies that allow causal conclusions and thus these studies help to provide insights into the causality of the internal interruption framework. The methodological rigor applied in the experimental setting suggests that internal interruptions do not harm task performance. Moreover, it is possible to conclude that even though human energy and internal interruptions are related, one does not influence the other when neglecting other job characteristics. Thus, the assumption that low levels of energy lead to internal interruptions is derived from theoretical assumptions (Brixey et al., 2007; Fritz et al., 2011; Hobfoll, 2002). It could not be proved by only investigating the relation between human energy and internal

interruptions but becomes evident when integrating other job characteristics, the reasons for and the type of internal interruption.

Second, the studies designs can result in retrospective bias which can influence the results. Especially when it comes to identifying the reasons for internal interruptions at work and the number of interruptions employees experience during the workday, this is a crucial point. By choosing two timepoints a day to investigate the relationship between human energy and internal interruptions at work, it is possible that retrospective bias may influence the studies' results and thereby reduce generalisability. Moreover, it is possible that the timepoints in the daily diary were poorly chosen, as the difference between the timepoints appears to be too large. This could result in no relationship between human energy in the morning and the number of interruptions in the afternoon and vice versa. Choosing the timepoints seems to be crucial to observing whether or not internal interruptions can function as an energy management strategy, resulting in an unclear consideration that internal interruptions may still function as an energy management strategy, but could also negatively influence human energy. The chosen timepoints that come along with retrospective biases do not allow a conclusion to this open question. Nevertheless, this approach was a suitable alternative to approach the observed phenomenon.

Third, our studies are limited in regard to the variables assessed, and thus cannot include other characteristics that might interact with the observed relationships (e.g. other work characteristics, personal traits or especially other concepts of human energy). For example, even though an experimental setting allows causal conclusions, the results are somehow narrowed. We only observed one interruption in both experiments, whereas research indicates that the frequency of interruptions influences the overall impact on performance (Baethge et al., 2015). Moreover, a design with the two different types of tasks within one experiment would furthermore improve the generated value, as it would allow a direct comparison which is not

provided by the current design. However, the methodological mix of the studies broadens the understanding of internal interruptions at work and defuses the limitations slightly.

Contrastingly, I want to highlight the methodological diversity of the studies and its advantage compared to previous research in this area. All four studies contribute to this methodological mix in their own way. The metanalytical approach integrates different human energy concepts and thereby helps to build a common sense on what human energy is and how it is related to work. Moreover, it allows an investigation of the conceptual jangle fallacy in this field of research, and contributes to research by respecting the request for parsimony in research (Le et al., 2010). Thus, the study design helps future research by establishing a common understanding of human energy. Differently, this dissertation also includes a mixed-method design which incorporates a qualitative aspect that reveals increased insights in comparison to self-report questionnaires (Johnson & Onwuegbuzie, 2004). By investigating internal interruptions in a real-work setting and applying a daily diary approach, I can draw conclusions on within-person variations across a workday. This is an advantage to earlier experimental studies as internal interruptions happen due to different experiences and mood states at work. Thus, the changes over the course of a work day will most likely affect when and how internal interruptions occur (e.g. fatigue and the need for recovery increases over the course of a work day (Parker et al., 2019)). In the context of human energy in relation to internal interruption, it is necessary to consider the fluctuation, as both change throughout the workday. The daily diary approach also allows for an examination of within-person differences that enable the exclusion of between-person variance and actually considers changes that occur because of the daily experiences of the person. Moreover, using two time points allows a test of how internal interruptions in the morning affect human energy in the afternoon and vice versa. This helps to investigate relationships across a workday and thereby broadens the understanding of the relationship between internal interruptions and human energy. Taken together, investigating fluctuant concepts in a daily diary design benefits the accuracy of the results and helps to

identify changes within persons as reasons for behaviour, whereas this is not the case in cross-sectional designs. The experimental study is again methodologically different to the other three studies. It allows the comparison of external and internal interruptions with non-interrupted work and excludes interfering aspects that cannot be controlled for in field studies which again allows to interpret causality. Thus, the results of the experiment can be attributed to the conditions and contribute to earlier literature by directly comparing the effects of external, internal and non-interrupted work on task performance in different task types. Moreover the experimental design contributes by controlling for the number of interruptions, which has not been controlled for thus far (Adler & Benbunan-Fich, 2013, 2015; Katidioti et al., 2014; Katidioti et al., 2016), and proves to be relevant when it comes to external interruptions (Baethge et al., 2015).

Taken together this dissertation encompasses both limitations and strengths. The methodological mix and rigor applied in the studies help to clarify the role of internal interruptions, their antecedents and their consequences from different angles and thereby provides a broad perspective that incorporates internal interruptions into the multitasking research. Summing up the limitations and the advantages, this dissertation identifies new research agendas that will be discussed next.

6.4 Future Research

Based on the results of the studies, the limitations and my conclusions on how these results affect multitasking research in general, or research on internal interruptions as energy management strategies more specifically, this dissertation presents some ideas and proposals for future research in this field.

This dissertation could not prove internal interruptions to be a general energy management strategy. However, the analysis did not indicate a negative effect of internal interruptions on human energy either. Due to the disadvantage that the studies could not

integrate the reasons for internal interruptions and the activities performed during the interruptions, it is not possible to exclude that these are crucial aspects that influence how internal interruptions function. When taking into account the finding that not all internal interruptions are equal, as well as the earlier findings on micro breaks and energy management (Fritz et al., 2011; Zacher et al., 2014), a new research question reveals itself. How do different reasons for internal interruptions as well as the interrupting task (e.g. opening the window or writing an email) affect the relationship between energy and internal interruptions? This question is important because it helps to provide guidelines for employee behaviour at work and can give information on how individuals can use interruptions efficiently at work. I assume that internal interruptions such as getting a glass of water, opening the window or having a small non-work-related chat with a colleague, could indeed result in improved energy levels afterwards, as shown by earlier research on microbreaks (Fritz et al., 2011; Zacher et al., 2014). Whereas the simple switch to another straining task could rely on the same cognitive resources (Brixey et al., 2007) and thereby could even decrease human energy and would not work as energy management strategy. Thus, it is crucial to have a closer look at the type of interruption and its effect on human energy. This could be done for example in another diary study, that integrates the activity during the internal interruption as interacting factor of the relationship between internal interruptions and human energy.

Besides the missing integration of the reasons for internal interruptions, it is necessary to reshuffle the chosen measurement timepoints. It may be crucial to directly observe how the internal interruptions impacts the energy level, as human energy is a fluctuating concept that can vary strongly during a work day (Ten Brummelhuis & Bakker, 2012). To discover if the underlying process of internal interruptions is in fact energy management, future research needs to consider the timepoints as well as the reasons and the activities during the interruption and should establish a study that respects all of these aspects. Taken together, I would suggest implementing a study that uses a checklist for assessing the reasons for internal interruptions,

the number of interruptions as well as the level of energy and asks participants to report this information every hour. This way the time difference would decrease, and it would still be possible to observe changes over the course of a workday. This data would also allow to observe the energy level one hour before the reported interruptions and one hour afterwards, which could help to disentangle causality in this relationship. As study 2a and 2b both revealed that it is difficult for individuals to understand what is meant by internal interruptions, it is important to explain internal interruptions extensively to the participants and integrate a manipulation check if participants truly understood what internal interruptions are.

Next to investigating internal interruptions in a real work setting, it could also be helpful to assess internal interruptions in experimental settings which can assess human energy and the number of interruptions differently than self-report questionnaires. Investigating energy through physiological measurements, such as ECG detecting heart-rate-variability (Parker et al., 2019), during internal interruptions would help to investigate the relationship in a controlled environment that eliminates other affecting variables. This could reduce bias in internal interruption research and would help to identify if internal interruptions can function as an energy management strategy when assessing human energy objectively.

There are many aspects at work that may affect how employees structure their work, how they experience the workday, and if they get distracted by interruptions at work or not. Up to date only a limited number of aspects have been considered in research on multitasking and internal interruptions. Among the considered aspects are task difficulty (Adler & Benbunan-Fich, 2015), polychronicity (a personal characteristic that describes if a person enjoys multitasking or not) (Kirchberg, Roe, & van Eerde, 2015) and time pressure (Baethge & Rigotti, 2013). Nevertheless, there are other relevant aspects that have not been considered yet but could play an important role when establishing the resources relevant for internal interruptions. Job autonomy, to name one aspect, has been considered in this dissertation but did not show consistent results. Although job autonomy was perceived as high when participants were

allowed to interrupt themselves in the experiment, job autonomy could not be directly linked to internal interruptions at work and their impact on human energy. However, it would be beneficial for future research to integrate other variables that can help to explain the effects of internal interruptions (e.g. self-efficacy, as the belief to be able to successfully accomplish work (Bandura, 1977), or organisational support (Mauno & Ruokolainen, 2017), as well as situational characteristics) on employee performance and their well-being.

The results of the experiments suggest that internal interruptions can improve performance, however as highlighted above, many other aspects influence how internal interruptions affect the employee. Thus, I suspect that the impact of internal interruptions on performance are also affected by other aspects of work (e.g. organisational culture, work hours, quantity and importance of work tasks). To truly understand if internal interruptions positively affect work performance, future research should try to investigate this relationship in a real work setting. To eliminate common method bias, it would be beneficial to collect objective performance ratings or at least performance ratings from a third person (e.g. the supervisor). This way research could detect if internal interruptions during a normal workday also affect performance positively or if there are other more relevant aspects affecting this relationship. Because previous research also indicates that the number of interruptions influences their overall impact on performance (Baethge et al., 2015), assessing the number of internal interruptions would be beneficial. It could help to discover a possible U-shaped relationship between internal interruptions and performance.

The named indications for future research are not encompassing but taken together with the findings of this dissertation they would enable a greater understanding of how internal interruptions work. And help to answer the question, how those interruptions affect performance and human energy. Moreover, it can discover what types of internal interruptions can be beneficial and which could even be harmful in the sense of internal interruptions as an energy management strategy. Thus, this would help to further develop multitasking research by

precisely differentiating between the different forms of multitasking behaviour and providing new insights on internal interruptions.

6.5 Conclusion

Multitasking has been a prevalent research area in the last decades of organisational psychology. Research has highlighted its importance for everyday work life, work performance and employee well-being. The main objective of this dissertation was to gain a new perspective on multitasking by focussing on internal interruptions, as one of the two drivers for multitasking behaviour at work, and their link to human energy at work. The studies successfully showed that internal interruptions are indeed different to external interruptions, not only in their cause but also in their effect on work performance. Disentangling the underlying process of internal interruptions proved to be challenging and this thesis cannot confirm the use of internal interruptions as a strategy employee use to regain their energy. However, I hope that the studies highlight the importance of linking related research areas with one another and invite multitasking research to show more interest in internal interruptions at work, as they appear to be truly relevant for organisations today.

References

- Adamczyk, P. D., & Bailey, B. P. (2004). If not now, when? The effects of interruption at different moments within task execution. In : *Vol. vol. 6, issue no. 1. CHI letters, Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 271–278). New York N.Y.: Association for Computing Machinery.
- Adler, R. F., & Benbunan-Fich, R. (2012). Juggling on a high wire: Multitasking effects on performance. *International Journal of Human-Computer Studies*, 70(2), 156–168. <https://doi.org/10.1016/j.ijhcs.2011.10.003>
- Adler, R. F., & Benbunan-Fich, R. (2013). Self-interruptions in discretionary multitasking. *Computers in Human Behavior*, 29(4), 1441–1449. <https://doi.org/10.1016/j.chb.2013.01.040>
- Adler, R. F., & Benbunan-Fich, R. (2015). The effects of task difficulty and multitasking on performance. *Interacting with Computers*, 27(4), 430–439. <https://doi.org/10.1093/iwc/iwu005>
- Allen, T. D., Cho, E., & Meier, L. L. (2014). Work–family boundary dynamics. *Annual Review of Organizational Psychology and Organizational Behavior*, 1(1), 99–121. <https://doi.org/10.1146/annurev-orgpsych-031413-091330>
- Anderson, C., Heissler, C., Ohly, S., & David, K. (2016). Assessment of social roles for interruption management. In P. Lukowicz, A. Krüger, A. Bulling, Y.-K. Lim, & S. N. Patel (Eds.), *Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing: Adjunct : September 12- 16, 2016, Heidelberg, Germany* (pp. 1530–1535). New York, NY: ACM. <https://doi.org/10.1145/2968219.2968544>
- Bachmann, O., Grunschel, C., & Fries, S. (2019). Multitasking and feeling good? Autonomy of additional activities predicts affect. *Journal of Happiness Studies*, 20(3), 899–918. <https://doi.org/10.1007/s10902-018-9973-3>
- Baethge, A. (2013). *A daily perspective on work interruptions*, Mainz: Johannes Gutenberg-Universität.
- Baethge, A., & Rigotti, T. (2010). *Arbeitsunterbrechungen und Multitasking*. [Work interruptions and multitasking]. Dortmund/Berlin, Germany.
- Baethge, A., & Rigotti, T. (2013). Interruptions to workflow: their relationship with irritation and satisfaction with performance, and the mediating roles of time pressure and mental demands. *Work & Stress*, 27(1), 43–63. <https://doi.org/10.1080/02678373.2013.761783>
- Baethge, A., & Rigotti, T. (2015). Three-way interactions among interruptions/multitasking demands, occupational age, and alertness: A diary study. *Work, Aging and Retirement*, 1(4), 393–410. <https://doi.org/10.1093/workar/wav014>
- Baethge, A., Rigotti, T., & Roe, R. A. (2015). Just more of the same, or different? An integrative theoretical framework for the study of cumulative interruptions at work. *European Journal of Work and Organizational Psychology*, 24(2), 308–323. <https://doi.org/10.1080/1359432X.2014.897943>

- Bailey, B. P., & Konstan, J. A. (2006). On the need for attention-aware systems: Measuring effects of interruption on task performance, error rate, and affective state. *Computers in Human Behavior*, 22(4), 685–708. <https://doi.org/10.1016/j.chb.2005.12.009>
- Bakker, A. B., & Demerouti, E. (2007). The Job Demands-Resources model: state of the art. *Journal of Managerial Psychology*, 22(3), 309–328. <https://doi.org/10.1108/02683940710733115>
- Bakker, A. B., Demerouti, E., & Verbeke, W. (2004). Using the job demands-resources model to predict burnout and performance. *Human Resource Management*, 43(1), 83–104. <https://doi.org/10.1002/hrm.20004>
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191–215. <https://doi.org/10.1037/0033-295X.84.2.191>
- Baruch, Y., Grimland, S., & Vigoda-Gadot, E. (2014). Professional vitality and career success: Mediation, age and outcomes. *European Management Journal*, 32(3), 518–527. <https://doi.org/10.1016/j.emj.2013.06.004>
- Bauer, T. N., Bodner, T., Erdogan, B., Truxillo, D. M., & Tucker, J. S. (2007). Newcomer adjustment during organizational socialization: a meta-analytic review of antecedents, outcomes, and methods. *The Journal of Applied Psychology*, 92(3), 707–721. <https://doi.org/10.1037/0021-9010.92.3.707>
- Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology*, 74(5), 1252–1265. <https://doi.org/10.1037/0022-3514.74.5.1252>
- Baumeister, R. F., & Vohs, K. D. (2007). Self-regulation, ego depletion, and motivation. *Social and Personality Psychology Compass*, 1(1), 115–128. <https://doi.org/10.1111/j.1751-9004.2007.00001.x>
- Bennett, A. A., Bakker, A. B., & Field, J. G. (2018). Recovery from work-related effort: A meta-analysis. *Journal of Organizational Behavior*, 39(3), 262–275. <https://doi.org/10.1002/job.2217>
- Bhave, D., & Leftner, A. M. (2017). The other side: Occupational interactional requirements and work-home enrichment. *Academy of Management Journal*, 61(1), 139–164. <https://doi.org/10.5465/amj.2016.0369>
- Borman, W. C., & Motowidlo, S. J. (1993). Expanding the criterion domain to include elements of contextual performance. In N. Schmitt & W. C. Borman (Eds.), *Personnel Selection in Organization* (pp. 71–78). San Francisco: Jossey Bass.
- Boswell, W. R., Olson-Buchanan, J. B., & LePine, M. A. (2004). Relations between stress and work outcomes: The role of felt challenge, job control, and psychological strain. *Journal of Vocational Behavior*, 64(1), 165–181. [https://doi.org/10.1016/S0001-8791\(03\)00049-6](https://doi.org/10.1016/S0001-8791(03)00049-6)
- Brixey, J. J., Robinson, D. J., Johnson, C. W., Johnson, T. R., Turley, J. P., & Zhang, J. (2007). A concept analysis of the phenomenon interruption. *Advances in Nursing Science*, 30(1), E26–E42. <https://doi.org/10.1097/00012272-200701000-00012>

- Carayon, P., & Zijlstra, F. R. H. (1999). Relationship between job control, work pressure and strain: Studies in the USA and in The Netherlands. *Work & Stress*, *13*(1), 32–48. <https://doi.org/10.1080/026783799296174>
- Carmeli, A., Ben-Hador, B., Waldman, D. A., & Rupp, D. E. (2009). How leaders cultivate social capital and nurture employee vigor: Implications for job performance. *The Journal of Applied Psychology*, *94*(6), 1553–1561. <https://doi.org/10.1037/a0016429>
- Carmeli, A., McKay, A. S., & Kaufman, J. C. (2014). Emotional intelligence and creativity: The mediating role of generosity and vigor. *The Journal of Creative Behavior*, *48*(4), 290–309. <https://doi.org/10.1002/jocb.53>
- Carver, C. S., & Scheier, M. F. (1981). The self-attention-induced feedback loop and social facilitation. *Journal of Experimental Social Psychology*, *17*(6), 545–568. [https://doi.org/10.1016/0022-1031\(81\)90039-1](https://doi.org/10.1016/0022-1031(81)90039-1)
- Carver, C. S., & Scheier, M. F. (1990). Origins and functions of positive and negative affect: A control-process view. *Psychological Review*, *97*(1), 19–35. <https://doi.org/10.1037/0033-295X.97.1.19>
- Cheng, T., Mauno, S., & Lee, C. (2014). Do job control, support, and optimism help job insecure employees?: A three-wave study of buffering effects on job satisfaction, vigor and work-family enrichment. *Social Indicators Research*, *118*(3), 1269–1291. <https://doi.org/10.1007/s11205-013-0467-8>
- Coetzee, M., & Villiers, M. de. (2010). Sources of job stress, work engagement and career orientations of employees in a South African financial institution. *Southern African Business Review*, *14*(1), 27–58.
- Cole, M. S., Bruch, H., & Vogel, B. (2012). Energy at work: A measurement validation and linkage to unit effectiveness. *Journal of Organizational Behavior*, *33*(4), 445–467. <https://doi.org/10.1002/job.759>
- Cole, M. S., Walter, F., Bedeian, A. G., & O'Boyle, E. H. (2012). Job burnout and employee engagement: A meta-analytic examination of construct proliferation. *Journal of Management*, *38*(5), 1550–1581.
- Connolly, J. J., & Viswesvaran, C. (2000). The role of affectivity in job satisfaction: a meta-analysis. *Personality and Individual Differences*, *29*(2), 265–281. [https://doi.org/10.1016/S0191-8869\(99\)00192-0](https://doi.org/10.1016/S0191-8869(99)00192-0)
- Czerwinski, M., Cutrell, E., & Horvitz, E. (2000). Instant messaging: Effects of relevance and timing. *People and Computers XIV: Proceedings of HCI*. (1), 71–76.
- Czerwinski, M., Horvitz, E., & Wilhite, S. (2004). A diary study of task switching and interruptions. In E. Dykstra-Erickson & M. Tscheligi (Eds.), *Proceedings of the 2004 conference on Human factors in computing systems - CHI '04* (pp. 175–182). New York, New York, USA: ACM Press. <https://doi.org/10.1145/985692.985715>
- D'Innocenzo, L., Mathieu, J. E., & Kukenberger, M. R. (2016). A meta-analysis of different forms of shared leadership–team performance relations. *Journal of Management*, *42*(7), 1964–1991. <https://doi.org/10.1177/0149206314525205>

- Dabbish, L. A., Mark, G., & González, V. M. (2011). Why do i keep interrupting myself? In D. Tan, G. Fitzpatrick, C. Gutwin, B. Begole, & W. A. Kellogg (Eds.), *Conference proceedings and extended abstracts / the 29th Annual CHI Conference on Human Factors in Computing Systems: CHI 2011, Vancouver, BC, May 7 - 12, 2011* (p. 3127). New York, NY: ACM. <https://doi.org/10.1145/1978942.1979405>
- Dahlke, J. A., & Wiernik, B. M. (2018). psychmeta : An R package for psychometric meta-analysis. *Applied Psychological Measurement*, 014662161879593. <https://doi.org/10.1177/0146621618795933>
- Dane, E. (2018). Where is my mind? Theorizing mind wandering and its performance-related consequences in Organizations. *Academy of Management Review*, 43(2), 179–197.
- Daniels, K. (2000). Measures of five aspects of affective well-being at work. *Human Relations*, 53(2), 275–294. <https://doi.org/10.1177/a010564>
- David, K., Bieling, G., Bohnstedt, D., Jandt, S., Ohly, S., Robnagel, A., . . . Wacker, A. (2014). Balancing the online life: Mobile usage scenarios and strategies for a new communication paradigm. *IEEE Vehicular Technology Magazine*, 9(3), 72–79. <https://doi.org/10.1109/MVT.2014.2333763>
- Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology/Psychologie Canadienne*, 49(3), 182–185. <https://doi.org/10.1037/a0012801>
- Demerouti, E., Bakker, A. B., Sonnentag, S., & Fullagar, C. J. (2012). Work-related flow and energy at work and at home: A study on the role of daily recovery. *Journal of Organizational Behavior*, 33(2), 276–295. <https://doi.org/10.1002/job.760>
- Demerouti, E., Mostert, K., & Bakker, A. B. (2010). Burnout and work engagement: a thorough investigation of the independency of both constructs. *Journal of Occupational Health Psychology*, 15(3), 209–222. <https://doi.org/10.1037/a0019408>
- DGB-Index Gute Arbeit. (2017). *Arbeitshetze und Arbeitsintensivierung bei digitaler Arbeit: So beurteilen die Beschäftigten ihre Arbeitsbedingungen. Ergebnisse einer Sonderauswertung der Repräsentativumfrage zum DGB-Index Gute Arbeit 2016*. Berlin.
- Dijksterhuis, A. (2004). Think different: the merits of unconscious thought in preference development and decision making. *Journal of Personality and Social Psychology*, 87(5), 586–598. <https://doi.org/10.1037/0022-3514.87.5.586>
- Dijksterhuis, A., & Meurs, T. (2006). Where creativity resides: the generative power of unconscious thought. *Consciousness and Cognition*, 15(1), 135–146. <https://doi.org/10.1016/j.concog.2005.04.007>
- Dockray, S., & Steptoe, A. (2010). Positive affect and psychobiological processes. *Neuroscience and Biobehavioral Reviews*, 35(1), 69–75. <https://doi.org/10.1016/j.neubiorev.2010.01.006>
- Dubreuil, P., Forest, J., & Courcy, F. (2014). From strengths use to work performance: The role of harmonious passion, subjective vitality, and concentration. *The Journal of Positive Psychology*, 9(4), 335–349. <https://doi.org/10.1080/17439760.2014.898318>
- Durkheim, E. (1954). *The elementary forms of religious life*. New York: Free Press.

- Eastwood, J. D., Frischen, A., Fenske, M. J., & Smilek, D. (2012). The unengaged mind: Defining boredom in terms of attention. *Perspectives on Psychological Science*, 7(5), 482–495.
- Eyrolle, H., & Cellier, J.-M. (2000). The effects of interruptions in work activity: field and laboratory results. *Applied Ergonomics*, 31(5), 537–543. [https://doi.org/10.1016/S0003-6870\(00\)00019-3](https://doi.org/10.1016/S0003-6870(00)00019-3)
- Field, A. P. (2001). Meta-analysis of correlation coefficients: A Monte Carlo comparison of fixed- and random-effects methods. *Psychological Methods*, 6(2), 161–180. <https://doi.org/10.1037/1082-989X.6.2.161>
- Finkel, S. E. (1995). *Casual analysis with panel data* ([1. print.]). *Sage university papers: Vol. 105*. Thousand Oaks, Calif.: Sage Publ.
- Fisher, C. D. (1998). Effects of external and internal interruptions on boredom at work: Two studies. *Journal of Organizational Behavior*, 5(19), 503–522.
- Flanagan, J. C. (1954). The critical incident technique. *Psychological Bulletin*, 51(4), 327–358. <https://doi.org/10.1037/h0061470>
- Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist*, 56(3), 218–226.
- Frese, M., & Fay, D. (2001). 4. Personal initiative: An active performance concept for work in the 21st century. *Research in Organizational Behavior*, 23, 133–187. [https://doi.org/10.1016/S0191-3085\(01\)23005-6](https://doi.org/10.1016/S0191-3085(01)23005-6)
- Frese, M., & Zapf, D. (1994). Actions as the core of work psychology: A German approach. In M. D. Dunnette, L. M. Hough, & H. C. Triandis (Eds.), *Handbook of industrial and organizational psychology* (2nd ed., Vol. 4, pp. 271–340). Palo Alto, CA: Consulting Psychologists Press.
- Freud, S. (1961). *Civilization and its discontents*. New York: Norton.
- Fried, Y., & Ferris, G. R. (1987). The validity of the job characteristics model: A review and meta-analysis. *Personnel Psychology*, 40(2), 287–322. <https://doi.org/10.1111/j.1744-6570.1987.tb00605.x>
- Fritz, C., Ellis, A. M., Demsky, C. A., Lin, B. C., & Guros, F. (2013). Embracing work breaks: Recovering from work stress. *Organizational Dynamics*, 42(4), 274–280. <https://doi.org/10.1016/j.orgdyn.2013.07.005>
- Fritz, C., Lam, C. F., & Spreitzer, G. M. (2011). It's the little things that matter: An examination of knowledge workers' energy management. *Academy of Management Perspectives*, 25(3), 28–39.
- Funke, J., & Krüger, T. (1995). Plan-a-Day:Konzeption eines modifizierbaren Instruments zur Führungskräfte-Auswahl sowie erste empirische Befunde. [Plan-a-day: Construction of a modifyable instrument for the selection of managers and first results.]. In J. Funke & A. Fritz (Eds.), *Plan-a-Day: Konzeption eines modifizierbaren Instruments zur Führungskräfte-Auswahl sowie erste empirische Befunde* (pp. 97–120). Heidelberg University Library.

- Gagné, M., & Deci, E. L. (2005). Self-determination theory and work motivation. *Journal of Organizational Behavior*, 26(4), 331–362. <https://doi.org/10.1002/job.322>
- Gagné, M., Senécal, C. B., & Koestner, R. (1997). Proximal job characteristics, feelings of empowerment, and intrinsic motivation:: A multidimensional model. *Journal of Applied Social Psychology*, 14(27), 1222–1240.
- Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research. Observations*. New York, NY: Aldine.
- Gökçearslan, Ş., Mumcu, F. K., Haşlamam, T., & Çevik, Y. D. (2016). Modelling smartphone addiction: The role of smartphone usage, self-regulation, general self-efficacy and cyberloafing in university students. *Computers in Human Behavior*, 63, 639–649. <https://doi.org/10.1016/j.chb.2016.05.091>
- González, V. M., & Mark, G. (2004). Constant, constant, multi-tasking craziness: Managing multiple working spheres. In M. T. Elizabeth Dykstra-Erickson (Ed.), *CHI '04 CHI 2004 Conference on human factors in computing systems* (pp. 113–120). New York, NY, USA: ACM.
- González, V. M., & Mark, G. (2005). Managing currents of work:: Multi-tasking among multiple collaborations. In H. Gellersen, K. Schmidt, M. Beaudouin-Lafon, & M. Mackay (Eds.), *ECSCW 2005: Proceedings of the Ninth European Conference on Computer-Supported Cooperative Work* (pp. 143–162). Springer.
- Goodman, S. A., & Svyantek, D. J. (1999). Person–organization fit and contextual performance: do shared values matter. *Journal of Vocational Behavior*, 55(2), 254–275. <https://doi.org/10.1006/jvbe.1998.1682>
- Gorsuch, R. L. (1997). Exploratory factor analysis: its role in item analysis. *Journal of Personality Assessment*, 68(3), 532–560. https://doi.org/10.1207/s15327752jpa6803_5
- Hacker, W. (1973). *Allgemeine Arbeits- und Ingenieurpsychologie: Psychische Struktur und Regulation von Arbeitstätigkeiten*. Berlin: Dt. Verl. der Wiss.
- Hacker, W. (2003). Action Regulation Theory: A practical tool for the design of modern work processes? *European Journal of Work and Organizational Psychology*, 12(2), 105–130. <https://doi.org/10.1080/13594320344000075>
- Hacker, W. (2005). *Allgemeine Arbeitspsychologie: Psychische Regulation von Wissens-, Denk- und körperlicher Arbeit* (2., vollst. überarb. und erg. Aufl.). *Schriften zur Arbeitspsychologie: Vol. 58*. Bern: Huber.
- Hackman, J. R., & Oldham, G. R. (1975). Development of the job diagnostic survey. *The Journal of Applied Psychology*, 60(2), 159–170. <https://doi.org/10.1037/h0076546>
- Halbesleben, J. R. (2010). A meta-analysis of work engagement: Relationships with burnout, demands, resources and consequences. In A. B. Bakker (Ed.), *Work engagement: A handbook of essential theory and research* (pp. 102–117). Hove [u.a.]: Psychology Press.
- Hallberg, L. R.-M. (2006). The “core category” of grounded theory: Making constant comparisons. *International Journal of Qualitative Studies on Health and Well-Being*, 1(3), 141–148. <https://doi.org/10.1080/17482620600858399>

- Harter, J. K., & Schmidt, F. L. (2008). Conceptual versus empirical distinctions among constructs: Implications for discriminant validity. *Industrial and Organizational Psychology, 1*(1), 36–39. <https://doi.org/10.1111/j.1754-9434.2007.00004.x>
- Harvey, T. A. (2002). *Professional vitality and the principalship: Construct validity study*. Maine.
- Hennessey, B. A., & Amabile, T. M. (2010). Creativity. *Annual Review of Psychology, 61*, 569–598. <https://doi.org/10.1146/annurev.psych.093008.100416>
- Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist, 44*(3), 513–524. <https://doi.org/10.1037/0003-066X.44.3.513>
- Hobfoll, S. E. (2002). Social and psychological resources and adaptation. *Review of General Psychology, 6*(4), 307–324. <https://doi.org/10.1037/1089-2680.6.4.307>
- Hobfoll, S. E. (2011). Conservation of resource caravans and engaged settings. *Journal of Occupational and Organizational Psychology, 84*(1), 116–122. <https://doi.org/10.1111/j.2044-8325.2010.02016.x>
- Hobfoll, S. E., Halbesleben, J. R., Neveu, J.-P., & Westman, M. (2018). Conservation of Resources in the Organizational Context: The Reality of Resources and Their Consequences. *Annual Review of Organizational Psychology and Organizational Behavior, 5*(1), 103–128. <https://doi.org/10.1146/annurev-orgpsych-032117-104640>
- Hülshager, U. R., Lang, J. W. B., Depenbrock, F., Fehrmann, C., Zijlstra, F. R. H., & Alberts, H. J. E. M. (2014). The power of presence: the role of mindfulness at work for daily levels and change trajectories of psychological detachment and sleep quality. *Journal of Applied Psychology, 99*(6), 1113–1128. <https://doi.org/10.1037/a0037702>
- Humphrey, S. E., Nahrgang, J. D., & Morgeson, F. P. (2007). Integrating motivational, social, and contextual work design features: a meta-analytic summary and theoretical extension of the work design literature. *The Journal of Applied Psychology, 92*(5), 1332–1356. <https://doi.org/10.1037/0021-9010.92.5.1332>
- Hunter, J. E., & Schmidt, F. L. (2004). *Methods of meta-analysis correcting error and bias in research findings* (2nd ed.). Thousand Oaks [u.a.]: Sage Publ.
- Imhof, M. (1998). Erprobung der deutschen Version der Adjektiv-Checkliste nach Thayer (1989) zur Erfassung der aktuellen Aktiviertheit [Validation study on the German version of the Activation-Deactivation Adjective Checklist (AD-ACL) by Thayer (1989)]. *Zeitschrift Für Differentielle Und Diagnostische Psychologie, 19*(3), 179–186.
- Inzlicht, M., Schmeichel, B. J., & Macrae, C. N. (2014). Why self-control seems (but may not be) limited. *Trends in Cognitive Sciences, 18*(3), 127–133. <https://doi.org/10.1016/j.tics.2013.12.009>
- Jackson, P. R., Wall, T. D., Martin, R., & Davids, K. (1993). New measures of job control, cognitive demand, and production responsibility. *Journal of Applied Psychology, 78*(5), 753–762. <https://doi.org/10.1037/0021-9010.78.5.753>
- Jett, Q. R., & George, J. M. (2003). Work interrupted: a closer look at the role of interruptions in organizational life. *Academy of Management Review, 28*(3), 494–507. <https://doi.org/10.2307/30040736>

- Jin, J., & Dabbish, L. A. (2009). Self-interruption on the computer: A typology of discretionary task interleaving. In Olsen, Dan R., Jr., Arthur, Richard, B., K. Hinckley, M. R. Morris, S. Hudson, & S. Greenberg (Eds.), *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (1799-1808). New York, New York, USA: ACM Press. Retrieved from <http://dl.acm.org/citation.cfm?id=1518701>
- Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose Time has come. *Educational Researcher*, *33*(7), 14–26. <https://doi.org/10.3102/0013189X033007014>
- Kane, M. J., & McVay, J. C. (2012). What Mind Wandering Reveals About Executive-Control Abilities and Failures. *Current Directions in Psychological Science*, *21*(5), 348–354. <https://doi.org/10.1177/0963721412454875>
- Kaplan, S. A., Bradley, J. C., Luchman, J. N., & Haynes, D. (2009). On the role of positive and negative affectivity in job performance: a meta-analytic investigation. *The Journal of Applied Psychology*, *94*(1), 162–176. <https://doi.org/10.1037/a0013115>
- Karasek, R. (1979). Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly*, *24*(2), 285–308. <https://doi.org/10.2307/2392498>
- Karasek, R., & Theorell, T. (1990). *Healthy work: Stress, productivity, and the reconstruction of working life*. New York: Basic Books.
- Kasser, V. G., & Ryan, R. M. (1999). The Relation of Psychological Needs for Autonomy and Relatedness to Vitality, Well-Being, and Mortality in a Nursing Home¹. *Journal of Applied Social Psychology*, *29*(5), 935–954. <https://doi.org/10.1111/j.1559-1816.1999.tb00133.x>
- Katidioti, I. (2016). *Understanding and managing interruptions: How to avoid watching cat videos all day long*. Groningen, The Netherlands: NetzoDruk.
- Katidioti, I., Borst, J. P., & Taatgen, N. A. (2014). What happens when we switch tasks: pupil dilation in multitasking. *Journal of Experimental Psychology: Applied*, *20*(4), 380–396. <https://doi.org/10.1037/xap0000031>
- Katidioti, I., Borst, J. P., van Vugt, M. K., & Taatgen, N. A. (2016). Interrupt me: External interruptions are less disruptive than self-interruptions. *Computers in Human Behavior*, *63*, 906–915. <https://doi.org/10.1016/j.chb.2016.06.037>
- Kaufman, J. C., & Sternberg, R. J. (Eds.). (2010). *Cambridge handbooks in psychology. The Cambridge handbook of creativity*. Cambridge, New York, Melbourne: Cambridge University Press. Retrieved from <http://www.loc.gov/catdir/enhancements/fy1005/2010000993-b.html>
- Keller, J., & Bless, H. (2008). Flow and regulatory compatibility: an experimental approach to the flow model of intrinsic motivation. *Personality & Social Psychology Bulletin*, *34*(2), 196–209. <https://doi.org/10.1177/0146167207310026>
- Kiesel, A., Steinhauser, M., Wendt, M., Falkenstein, M., Jost, K., Philipp, A. M., & Koch, I. (2010). Control and interference in task switching: A review. *Psychological Bulletin*, *136*(5), 849–874. <https://doi.org/10.1037/a0019842>

- Kim, S., Park, Y., & Niu, Q. (2017). Micro-break activities at work to recover from daily work demands. *Journal of Organizational Behavior*, 38(1), 28–44. <https://doi.org/10.1002/job.2109>
- Kirchberg, D. M., Roe, R. A., & van Eerde, W. (2015). Polychronicity and Multitasking: A Diary Study at Work. *Human Performance*, 28(2), 112–136.
- Kleine, A.-K., Rudolph, C. W., & Zacher, H. (2019, in press). Thriving at work: A meta-analysis. *Journal of Organizational Behavior*.
- König, C. J., Bühner, M., & Mürling, G. (2005). Working memory, fluid intelligence, and attention are predictors of multitasking performance, but polychronicity and extraversion are not. *Human Performance*, 18(3), 243–266. https://doi.org/10.1207/s15327043hup1803_3
- Kristof-Brown, A. L.M.Y., Zimmerman, R. D., & Johnson, E. C. (2005). Consequences of individuals' fit at work: A meta-analysis of person-job, person-organization, person-group, and person-supervisor fit. *Personnel Psychology*, 58(2), 281–342. <https://doi.org/10.1111/j.1744-6570.2005.00672.x>
- Lang, J., Bliese, P. D., Lang, J. W. B., & Adler, A. B. (2011). Work gets unfair for the depressed: cross-lagged relations between organizational justice perceptions and depressive symptoms. *The Journal of Applied Psychology*, 96(3), 602–618. <https://doi.org/10.1037/a0022463>
- Langfred, C. W., & Moyer, N. A. (2004). Effects of task autonomy on performance: an extended model considering motivational, informational, and structural mechanisms. *The Journal of Applied Psychology*, 89(6), 934–945. <https://doi.org/10.1037/0021-9010.89.6.934>
- Le, H., Schmidt, F. L., Harter, J. K., & Lauver, K. J. (2010). The problem of empirical redundancy of constructs in organizational research: An empirical investigation. *Organizational Behavior and Human Decision Processes*, 112(2), 112–125. <https://doi.org/10.1016/j.obhdp.2010.02.003>
- Lei, X., Kaplan, S. A., Dye, C. E., & Wong, C. M. (2018). On the subjective experience and correlates of downtime at work: A mixed-method examination. *Journal of Organizational Behavior*, 40(3), 360–381. <https://doi.org/10.1002/job.2336>
- LePine, J. A., Podsakoff, N. P., & LePine, M. A. (2005). A Meta-Analytic Test of the Challenge Stressor–Hindrance Stressor Framework: An Explanation for Inconsistent Relationships Among Stressors and Performance. *Academy of Management Journal*, 48(5), 764–775. <https://doi.org/10.5465/amj.2005.18803921>
- Liepmann, D., Beauducel, A., Brocke, B., & Amthauer, R. (2007). *Intelligenz-Struktur-Test 2000 R, 2 Erweiterte und Überarbeitete Auflage [Intelligence-Structure-Test 2000 R, 2nd Extended and Revised Edn]*. (2. erw. u. überarb. Aufl.). Göttingen, Wien u.a.: Hogrefe Verl. f. Psychologie.
- Liepmann, D., Beauducel, A., Brocke, B., & Nettelstroth, W. (2012). *IST-Screening: Intelligenz-Struktur-Test; Screening*. Göttingen, Bern, Wien, Paris, Oxford, Prag, Toronto, Cambridge, Mass., Amsterdam, Kopenhagen, Stockholm: Hogrefe.

- Little, T. D., Preacher, K. J., Selig, J. P., & Card, N. A. (2007). New developments in latent variable panel analyses of longitudinal data. *International Journal of Behavioral Development, 31*(4), 357–365. <https://doi.org/10.1177/0165025407077757>
- Lu, J. G., Akinola, M., & Mason, M. F. (2017). “Switching On” creativity: Task switching can increase creativity by reducing cognitive fixation. *Organizational Behavior and Human Decision Processes, 139*, 63–75. <https://doi.org/10.1016/j.obhdp.2017.01.005>
- Lurquin, J. H., Michaelson, L. E., Barker, J. E., Gustavson, D. E., Bastian, C. C. von, Carruth, N. P., & Miyake, A. (2016). No Evidence of the Ego-Depletion Effect across Task Characteristics and Individual Differences: A Pre-Registered Study. *PloS One, 11*(2), e0147770. <https://doi.org/10.1371/journal.pone.0147770>
- Mackey, J. D., Perrewé, P. L., & McAllister, C. P. (2017). Do I fit in?: Perceptions of organizational fit as a resource in the workplace stress process. *Group & Organization Management, 42*(4), 455–486. <https://doi.org/10.1177/1059601115625155>
- Madjar, N., & Shalley, C. E. (2008). Multiple tasks' and multiple goals' effect on creativity: Forced incubation or just a distraction? *Journal of Management, 34*(4), 786–805. <https://doi.org/10.1177/0149206308318611>
- Mark, G., Gudith, D., & Klocke, U. (2008). The cost of interrupted work. In M. Burnett (Ed.), *The 26th Annual CHI Conference on Human Factors in Computing Systems, CHI 2008: Conference proceedings ; April 5-10, 2008 in Florence, Italy* (p. 107). New York, NY: ACM. <https://doi.org/10.1145/1357054.1357072>
- Mauno, S., Kinnunen, U., & Ruokolainen, M. (2007). Job demands and resources as antecedents of work engagement: A longitudinal study. *Journal of Vocational Behavior, 70*(1), 149–171. <https://doi.org/10.1016/j.jvb.2006.09.002>
- Mauno, S., & Ruokolainen, M. (2017). Does organizational work–family support benefit temporary and permanent employees equally in a work–family conflict situation in relation to job satisfaction and emotional energy at work and at home? *Journal of Family Issues, 38*(1), 124–148. <https://doi.org/10.1177/0192513X15600729>
- McDaniel, M. (2009). Cumulative meta-analysis as a publication bias method. In *Annual Meeting of the Society for Industrial and Organizational Psychology, New Orleans, LA*.
- McFarlane, D. C. (2002). Comparison of four primary methods for coordinating the interruption of people in human-computer interaction. *Human-Computer Interaction, 17*(1), 63–139. https://doi.org/10.1207/S15327051HCI1701_2
- McFarlane, D. C., & Latorella, K. A. (2002). The scope and importance of human interruption in human-computer interaction design. *Human-Computer Interaction, 17*(1), 1–61. https://doi.org/10.1207/S15327051HCI1701_1
- Meyer, J. P., Stanley, D. J., Herscovitch, L., & Topolnytsky, L. (2002). Affective, continuance, and normative commitment to the organization: A meta-analysis of antecedents, correlates, and consequences. *Journal of Vocational Behavior, 61*(1), 20–52. <https://doi.org/10.1006/jvbe.2001.1842>
- Miller, J. B., & Stiver, I. (1997). *The healing connection*. Bosten, MA: Beacon Press.

- Mills, M. J., Culbertson, S. S., & Fullagar, C. J. (2011). Conceptualizing and measuring engagement: An analysis of the utrecht work engagement scale. *Journal of Happiness Studies*, 13(3), 519–545. <https://doi.org/10.1007/s10902-011-9277-3>
- Moghimi, D., Zacher, H., Scheibe, S., & van Yperen, N. W. (2017). The selection, optimization, and compensation model in the work context: A systematic review and meta-analysis of two decades of research. *Journal of Organizational Behavior*, 38(2), 247–275. <https://doi.org/10.1002/job.2108>
- Morgeson, F. P., Delaney-Klinger, K., & Hemingway, M. A. (2005). The importance of job autonomy, cognitive ability, and job-related skill for predicting role breadth and job performance. *The Journal of Applied Psychology*, 90(2), 399–406. <https://doi.org/10.1037/0021-9010.90.2.399>
- Morgeson, F. P., & Humphrey, S. E. (2006). The Work Design Questionnaire (WDQ): Developing and validating a comprehensive measure for assessing job design and the nature of work. *The Journal of Applied Psychology*, 91(6), 1321–1339. <https://doi.org/10.1037/0021-9010.91.6.1321>
- Muthén, L. K., & Muthén, B. O. (1998-2017). *Mplus User's Guide* (Eighth Edition). Los Angeles, CA: Muthén & Muthén.
- Nijstad, B. A., Dreu, C. K. W. de, Rietzschel, E. F., & Baas, M. (2010). The dual pathway to creativity model: Creative ideation as a function of flexibility and persistence. *European Review of Social Psychology*, 21(1), 34–77. <https://doi.org/10.1080/10463281003765323>
- Nijstad, B. A., & Stroebe, W. (2006). How the group affects the mind: a cognitive model of idea generation in groups. *Personality and Social Psychology Review*, 10(3), 186–213. https://doi.org/10.1207/s15327957pspr1003_1
- Nijstad, B. A., Stroebe, W., & Lodewijckx. (2003). Production blocking and idea generation: Does blocking interfere with cognitive processes. *Journal of Experimental Social Psychology*, 39(6), 531–548.
- Ohly, S., Göritz, A. S., & Schmitt, A. (2017). The power of routinized task behavior for energy at work. *Journal of Vocational Behavior*, 103, 132–142. <https://doi.org/10.1016/j.jvb.2017.08.008>
- Ohly, S., Sonnentag, S., Niessen, C., & Zapf, D. (2010). Diary studies in organizational research: An introduction and some practical recommendations. *Journal of Personnel Psychology*, 9(2), 79–93. <https://doi.org/10.1027/1866-5888/a000009>
- Parker, S. K., Bindl, U. K., & Strauss, K. (2010). Making Things Happen: A Model of Proactive Motivation. *Journal of Management*, 36(4), 827–856.
- Parker, S. L., Sonnentag, S., Jimmieson, N. L., & Newton, C. J. (2019). Relaxation during the evening and next-morning energy: The role of hassles, uplifts, and heart rate variability during work. *Journal of Occupational Health Psychology*. Advance online publication. <https://doi.org/10.1037/ocp0000155>
- Paterson, T. A., Harms, P. D., Steel, P., & Credé, M. (2016). An Assessment of the Magnitude of Effect Sizes. *Journal of Leadership & Organizational Studies*, 23(1), 66–81. <https://doi.org/10.1177/1548051815614321>

- Payne, S. J., Duggan, G. B., & Neth, H. (2007). Discretionary task interleaving: heuristics for time allocation in cognitive foraging. *Journal of Experimental Psychology. General*, *136*(3), 370–388.
- Phillips, L. H., Kliegel, M., & Martin, M. (2006). Age and planning tasks: the influence of ecological validity. *International Journal of Aging & Human Development*, *62*(2), 175–184. <https://doi.org/10.2190/EM1W-HAYC-TMLM-WW8X>
- Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology*, *63*, 539–569. <https://doi.org/10.1146/annurev-psych-120710-100452>
- Podsakoff, P. M., & MacKenzie, S. B. (1994). Organizational citizenship behaviors and sales unit effectiveness. *Journal of Marketing Research*, *31*(3), 351–363. <https://doi.org/10.2307/3152222>
- Prem, R., Ohly, S., Kubicek, B., & Korunka, C. (2017). Thriving on challenge stressors? Exploring time pressure and learning demands as antecedents of thriving at work. *Journal of Organizational Behavior*, *38*(1), 108–123. <https://doi.org/10.1002/job.2115>
- Quinn, R. W., & Dutton, J. E. (2005). Coordination as energy-in-conversation. *Academy of Management Review*, *30*(1), 36–57. <https://doi.org/10.5465/AMR.2005.15281422>
- Quinn, R. W., Spreitzer, G. M., & Lam, C. F. (2012). Building a sustainable model of human energy in organizations: Exploring the critical role of resources. *The Academy of Management Annals*, *6*(1), 337–396. <https://doi.org/10.1080/19416520.2012.676762>
- Rauthmann, & Sherman. (2017). *S8-I - Situational Eight-I - deutsche Fassung*.
- Reijseger, G., Peeters, M. C. W., Taris, T. W., & Schaufeli, W. B. (2016). From motivation to activation: Why engaged workers are better performers. *Journal of Business and Psychology*, *32*(2), 117–130. <https://doi.org/10.1007/s10869-016-9435-z>
- Reis, H. T., Sheldon, K. M., Gable, S. L., Roscoe, J., & Ryan, R. M. (2000). Daily well-being: The role of autonomy, competence, and relatedness. *Personality and Social Psychology Bulletin*, *26*(4), 419–435. <https://doi.org/10.1177/0146167200266002>
- Revelle. (2018). psych: Procedures for personality and psychological research. Northwestern University Evanston, Illinois, USA. Retrieved from <https://CRAN.R-project.org/package=psych>
- Rheinberg, F., Vollmeyer, R., & Burns, B. D. (2001). FAM: Ein Fragebogen zur Erfassung aktueller Motivation in Lern- und Leistungssituationen. *Diagnostica*, *2*, 57–66.
- Rigotti, T., Baethge, A., & Freude, G. (2012). Arbeitsunterbrechungen als tägliche Belastungsquelle. In B. Badura, A. Ducki, H. Schröder, J. Klose, & M. Meyer (Eds.), *Fehlzeiten-Report 2012* (pp. 61–69). Berlin, Heidelberg: Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-29201-9_7
- Roe, R. A. (1999). Work performance: A multiple regulation perspective. In C. L. Cooper & I. T. Robertson (Eds.), *International review of industrial and organizational psychology* (Vol. 14, pp. 231–335). New York, NY, US: John Wiley & Sons Ltd.

- Rouncefield, M., Viller, S., Hughes, J. A., & Rodden, T. (1995). Working with “constant interruption”: CSCW and the small office. *The Information Society*, *11*(3), 173–188. <https://doi.org/10.1080/01972243.1995.9960191>
- Russell, E., & Daniels, K. (2018). Measuring affective well-being at work using short-form scales: Implications for affective structures and participant instructions. *Human Relations*, *71*(11), 1478–1507. <https://doi.org/10.1177/0018726717751034>
- Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological Review*, *110*(1), 145–172. <https://doi.org/10.1037/0033-295X.110.1.145>
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68–78. <https://doi.org/10.1037//0003-066X.55.1.68>
- Ryan, R. M., & Frederick, C. (1997). On energy, personality, and health: Subjective vitality as a dynamic reflection of well-being. *Journal of Personality*, *65*(3), 529–565. <https://doi.org/10.1111/j.1467-6494.1997.tb00326.x>
- Rydstedt, L. W., Ferrie, J., & Head, J. (2006). Is there support for curvilinear relationships between psychosocial work characteristics and mental well-being? Cross-sectional and long-term data from the Whitehall II study. *Work & Stress*, *20*(1), 6–20. <https://doi.org/10.1080/02678370600668119>
- Salvucci, D. D. (2005). A multitasking general executive for compound continuous tasks. *Cognitive Science*, *29*(3), 457–492. https://doi.org/10.1207/s15516709cog0000_19
- Sasangohar, F., Donmez, B., Trbovich, P., & Easty, A. C. (2012). Not All Interruptions are Created Equal: Positive Interruptions in Healthcare. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, *56*(1), 824–828.
- Schaufeli, W. B. (2012). Work engagement: What do we know and where do we go? *Romanian Journal of Applied Psychology*. (14.1), 3–10.
- Schaufeli, W. B., & Bakker, A. B. (2003). *UWES Utrecht work engagement scale. Preliminary manual [Version 1, November 2003]*. Utrecht University: Occupational Health Psychology Unit.
- Schaufeli, W. B., Bakker, A. B., & Salanova, M. (2006). The measurement of work engagement with a short questionnaire. *Educational and Psychological Measurement*, *66*(4), 701–716. <https://doi.org/10.1177/0013164405282471>
- Schaufeli, W. B., Salanova, M., González-Romá, V., & Bakker, A. B. (2002). The measurement of engagement and burnout: A two sample confirmatory factor analytic approach. *Journal of Happiness Studies*, *3*(1), 71–92. <https://doi.org/10.1023/A:1015630930326>
- Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2008). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online*, *8*(2), 23–74.
- Schmitt, A., Belschak, F. D., & Den Hartog, D. N. (2017). Feeling vital after a good night's sleep: The interplay of energetic resources and self-efficacy for daily proactivity. *Journal of Occupational Health Psychology*, *22*(4), 443–454. <https://doi.org/10.1037/ocp0000041>

- Schmitt, A., Ohly, S., & Kleespies, N. (2015). Time pressure promotes work engagement. *Journal of Personnel Psychology, 14*(1), 28–36. <https://doi.org/10.1027/1866-5888/a000119>
- Schuler, H., Gelléri, P., Winzen, J. M., & Görlich, Y. (2013). *DBK-PG: Diagnose berufsbezogener Kreativität ; Planung und Gestaltung*. Göttingen, Bern, Wien, Paris, Oxford, Prag, Toronto, Boston, Amsterdam, Kopenhagen, Stockholm, Florenz, Helsinki: Hogrefe.
- Schwartz, T., & McCarthy, C. (2007). Manage your energy, not your time. Retrieved from <https://hbr.org/2007/10/manage-your-energy-not-your-time>
- Semmer, N., Zapf, D., & Dunckel, H. (1999). Instrument zur stressbezogenen Tätigkeitsanalyse (ISTA). In H. Dunckel (Ed.), *Mensch, Technik, Organisation: Vol. 14. Handbuch psychologischer Arbeitsanalyseverfahren* (pp. 179–204). Zürich: Vdf Hochschul-Verl. an der ETH.
- Seo, M.-G., Barrett, L. F., & Bartunek, J. M. (2004). The Role of Affective Experience in Work Motivation. *Academy of Management Review, 29*(3), 423–439. <https://doi.org/10.5465/amr.2004.13670972>
- Shirom, A. (2003). Feeling vigorous at work? : The construct of vigor and the study of positive affect in organizations. In P. L. Perrewe & D. C. Ganster (Eds.), *Research in occupational stress and well being: v. 3. Emotional and physiological processes and positive intervention strategies* (1st ed., pp. 135–164).
- Shirom, A. (2011). Vigor as a positive affect at work: Conceptualizing vigor, its relations with related constructs, and its antecedents and consequences. *Review of General Psychology, 15*(1), 50–64. <https://doi.org/10.1037/a0021853>
- Silvia, P. J., & Gendolla, G. H. E. (2001). On introspection and self-perception: Does self-focused attention enable accurate self-knowledge? *Review of General Psychology, 5*(3), 241–269. <https://doi.org/10.1037/1089-2680.5.3.241>
- Sio, U. N., & Ormerod, T. C. (2009). Does incubation enhance problem solving? A meta-analytic review. *Psychological Bulletin, 135*(1), 94–120. <https://doi.org/10.1037/a0014212>
- Smallwood, J. (2013). Distinguishing how from why the mind wanders: a process-occurrence framework for self-generated mental activity. *Psychological Bulletin, 139*(3), 519–535.
- Smallwood, J., & Schooler, J. W. (2015). The science of mind wandering: empirically navigating the stream of consciousness. *Annual Review of Psychology, 66*, 487–518. <https://doi.org/10.1146/annurev-psych-010814-015331>
- Sonnentag, S., Binnewies, C., & Mojza, E. J. (2008). “Did you have a nice evening?”: A day-level study on recovery experiences, sleep, and affect. *Journal of Applied Psychology, 93*(3), 674–684.
- Sonnentag, S., Reinecke, L., Mata, J., & Vorderer, P. (2018). Feeling interrupted-being responsive: How online messages relate to affect at work. *Journal of Organizational Behavior, 39*(3), 369–383. <https://doi.org/10.1002/job.2239>

- Sonnentag, S., & Zijlstra, F. R. H. (2006). Job characteristics and off-job activities as predictors of need for recovery, well-being, and fatigue. *The Journal of Applied Psychology, 91*(2), 330–350. <https://doi.org/10.1037/0021-9010.91.2.330>
- Speier, C., Vessey, I., & Valacich, J. S. (2003). The effects of interruptions, task complexity, and information presentation on computer-supported decision-making performance. *Decision Sciences, 34*(4), 771–797. <https://doi.org/10.1111/j.1540-5414.2003.02292.x>
- Steel, P. (2007). The nature of procrastination: a meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological Bulletin, 133*(1), 65–94. <https://doi.org/10.1037/0033-2909.133.1.65>
- Steel, P., Brothen, T., & Wambach, C. (2001). Procrastination and personality, performance, and mood. *Personality and Individual Differences, 30*(1), 95–106. [https://doi.org/10.1016/S0191-8869\(00\)00013-1](https://doi.org/10.1016/S0191-8869(00)00013-1)
- Stegmann, S., van Dick, R., Ullrich, J., Charalambous, J., Menzel, B., Egold, N., & Wu, T. T.-C. (2010). Der Work Design Questionnaire. *Zeitschrift Für Arbeits- Und Organisationspsychologie A&O, 54*(1), 1–28. <https://doi.org/10.1026/0932-4089/a000002>
- Stillman, T. F., Baumeister, R. F., Vohs, K. D., Lambert, N. M., Fincham, F. D., & Brewer, L. E. (2010). Personal philosophy and personnel achievement: Belief in free will predicts better job performance. *Social Psychological and Personality Science, 1*(1), 43–50. <https://doi.org/10.1177/1948550609351600>
- Syrek, C. J., Kühnel, J., Vahle-Hinz, T., & Bloom, J. de. (2018). Share, like, twitter, and connect: Ecological momentary assessment to examine the relationship between non-work social media use at work and work engagement. *Work & Stress, 32*(3), 209–227. <https://doi.org/10.1080/02678373.2017.1367736>
- Ten Brummelhuis, L. L., & Bakker, A. B. (2012). A resource perspective on the work-home interface: the work-home resources model. *The American Psychologist, 67*(7), 545–556. <https://doi.org/10.1037/a0027974>
- Tett, R. P., & Meyer, J. P. (1993). Job satisfaction, organizational commitment, turnover intention, and turnover: Path analyses based on meta-analytic findings. *Personnel Psychology, 46*(2), 259–293. <https://doi.org/10.1111/j.1744-6570.1993.tb00874.x>
- Thayer, R. E. (1986). Activation-deactivation adjective check list: Current overview and structural analysis. *Psychological Reports, 58*(2), 607–614. <https://doi.org/10.2466/pr0.1986.58.2.607>
- Thompson, C. A., & Prottas, D. J. (2006). Relationships among organizational family support, job autonomy, perceived control, and employee well-being. *Journal of Occupational Health Psychology, 11*(1), 100–118. <https://doi.org/10.1037/1076-8998.10.4.100>
- Van den Broeck, A., Cuyper, N. de, Witte, H. de, & Vansteenkiste, M. (2010). Not all job demands are equal: Differentiating job hindrances and job challenges in the Job Demands–Resources model. *European Journal of Work and Organizational Psychology, 19*(6), 735–759. <https://doi.org/10.1080/13594320903223839>
- Van den Broeck, A., Vansteenkiste, M., Witte, H. de, & Lens, W. (2008). Explaining the relationships between job characteristics, burnout, and engagement: The role of basic

- psychological need satisfaction. *Work & Stress*, 22(3), 277–294.
<https://doi.org/10.1080/02678370802393672>
- Van Eerde, W. (2003). A meta-analytically derived nomological network of procrastination. *Personality and Individual Differences*, 35(6), 1401–1418. [https://doi.org/10.1016/S0191-8869\(02\)00358-6](https://doi.org/10.1016/S0191-8869(02)00358-6)
- Van Katwyk, P. T., Fox, S., Spector, P. E., & Kelloway, E. K. (2000). Using the job-related affective well-being scale (JAWS) to investigate affective responses to work stressors. *Journal of Occupational Health Psychology*, 5(2), 219–230.
- Vander Elst, T., van den Broeck, A., Witte, H. de, & Cuyper, N. de. (2012). The mediating role of frustration of psychological needs in the relationship between job insecurity and work-related well-being. *Work & Stress*, 26(3), 252–271.
<https://doi.org/10.1080/02678373.2012.703900>
- Vevea, J. L., & Hedges, L. V. (1995). A general linear model for estimating effect size in the presence of publication bias. *Psychometrika*, 60(3), 419–435.
- Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor package. *Journal of Statistical Software*, 36(3). <https://doi.org/10.18637/jss.v036.i03>
- Watson, D., Wiese, D., Vaidya, J., & Tellegen, A. (1999). The two general activation systems of affect: Structural findings, evolutionary considerations, and psychobiological evidence. *Journal of Personality and Social Psychology*, 76(5), 820–838.
<https://doi.org/10.1037/0022-3514.76.5.820>
- Wickens, C. D., Gutzwiller, R. S., & Santamaria, A. (2015). Discrete task switching in overload: A meta-analysis and a model. *International Journal of Human-Computer Studies*, 79, 79–84. <https://doi.org/10.1016/j.ijhcs.2015.01.002>
- Wilson, T. D., & Dunn, E. W. (2004). Self-knowledge: its limits, value, and potential for improvement. *Annual Review of Psychology*, 55, 493–518.
<https://doi.org/10.1146/annurev.psych.55.090902.141954>
- Wolff, W., Sieber, V., Bieleke, M., & Englert, C. (2019). Task duration and task order do not matter: no effect on self-control performance. *Psychological Research*. Advance online publication. <https://doi.org/10.1007/s00426-019-01230-1>
- Wright, T. A., & Cropanzano, R. (1998). Emotional exhaustion as a predictor of job performance and voluntary turnover. *Journal of Applied Psychology*, 83(3), 486–493.
<https://doi.org/10.1037/0021-9010.83.3.486>
- Wrosch, C., Scheier, M. F., Miller, G. E., Schulz, R., & Carver, C. S. (2003). Adaptive self-regulation of unattainable goals: goal disengagement, goal reengagement, and subjective well-being. *Personality & Social Psychology Bulletin*, 29(12), 1494–1508.
<https://doi.org/10.1177/0146167203256921>
- Xanthopoulou, D., Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2007). The role of personal resources in the job demands-resources model. *International Journal of Stress Management*, 14(2), 121–141. <https://doi.org/10.1037/1072-5245.14.2.121>

- Yerkes, R. M., & Dodson, J. D. (1908). The relation of strength of stimulus to rapidity of habit-formation. *Journal of Comparative Neurology and Psychology*, *18*(5), 459–482. <https://doi.org/10.1002/cne.920180503>
- Zacher, H., Brailsford, H. A., & Parker, S. L. (2014). Micro-breaks matter: A diary study on the effects of energy management strategies on occupational well-being. *Journal of Vocational Behavior*, *85*(3), 287–297. <https://doi.org/10.1016/j.jvb.2014.08.005>
- Zhou, J., & Hoever, I. J. (2014). Research on workplace creativity: A review and redirection. *Annual Review of Organizational Psychology and Organizational Behavior*, *1*(1), 333–359. <https://doi.org/10.1146/annurev-orgpsych-031413-091226>
- Zijlstra, F. R. H., Roe, R. A., Leonora, A. B., & Krediet, I. (1999). Temporal factors in mental work: Effects of interrupted activities. *Journal of Occupational and Organizational Psychology*, *72*(2), 163–185. <https://doi.org/10.1348/096317999166581>
- Zimber, A., & Rigotti, T. (2015). *Multitasking: Komplexe Anforderungen im Arbeitsalltag verstehen, bewerten und bewältigen* (1. Auflage). *Managementpsychologie: Band 1*. Göttingen: Hogrefe.

Publication Status and Scope of Responsibility

Study	Publication	Scope of responsibility
1	<p>Conference Contributions:</p> <p>Seipp, A., Schmitt, A. & Ohly, S. (2017). Human energy at work – a meta analytic approach to discover its nomological network. In Human Performance in Socio-Technical Systems: 10. Tagung der Fachgruppe Arbeits-, Organisations- und Wirtschaftspsychologie (AOW) der Deutschen Gesellschaft für Psychologie (DGPs) in Dresden, 13.-15.09.2017.</p> <p>Seipp, A., Schmitt, A. & Ohly, S. (2018). Energy at work - a meta analytic approach to human energy conceptualization and work-related concepts. 13th Conference of the European Academy of Occupational Psychology (EAOHP). Lisbon, Portugal.</p> <p>Submitted for publication:</p> <p>Seipp, A., Schmitt, A. & Ohly, S. Relationships between human energy at work and work-related concepts: A meta-analysis. Submitted revised form at: Journal of Vocational Behavior (23.07.2019) Under review.</p>	<p>Jointly responsible for conceptual and manuscript development.</p> <p>Solely responsible for data collection, and data analyses.</p>
2a	<p>Conference Contributions:</p> <p>Seipp, A. & Ohly, S. (2019). Why do we keep interrupting ourselves? Investigating affective and situational conditions that support self-interruptions. 19th European Association of Work and Organisational Psychology Congress, Turin, Italy.</p> <p>Accepted for publication:</p> <p>Seipp, A. Why do we keep interrupting ourselves? Exploring the reasons for internal interruptions at work. Performance Enhancement and Health. Publication date (12.11.2019) https://doi.org/10.1016/j.peh.2019.100148.</p>	<p>Solely responsible for conceptual development, data analyses, and manuscript development.</p>
2b	<p>Conference Contributions:</p> <p>Seipp, A. & Ohly, S. (2019). Und warum unterbrichst du dich bei der Arbeit? Eine Studie affektiver Bedingungen die Selbstunterbrechungen fördern. In Neue Formen der Arbeit in der digitalisierten Welt: Veränderungskompetenz stärken: 11. Tagung der Fachgruppe Arbeits-, Organisations- und Wirtschaftspsychologie (AOW) der Deutschen Gesellschaft für Psychologie (DGPs) in Braunschweig, 25.-27.09.2019.</p>	<p>Primarily responsible for conceptual development, data collection, data analyses, and manuscript development.</p>

3	<p>Conference Contributions: Seipp, A.-K., Heissler, C., & Ohly, S. (2018). Reduzieren Unterbrechungen die Arbeitsleistung? Ein experimenteller Vergleich selbst- und fremdbestimmter Unterbrechungen. 51. Kongress der Deutschen Gesellschaft für Psychologie (DGPs). Frankfurt, Germany.</p> <p>Seipp, A., Heissler, C., & Ohly, S. (2019). Interrupt yourself! When it comes to creative and planning performance switching tasks at your own pace beats concentrated and externally interrupted work. 19th European Association of Work and Organisational Psychology Congress, Turin, Italy.</p>	<p>Jointly responsible for conceptual development, data collection, data analyses, and manuscript development.</p>
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Appendix

Appendix A: List of References included into the Meta-Analysis on Human Energy from study 1

- Abid, G., Ijaz, S., Butt, T., Farooqi, S., & Rehmat, M. (2018). Impact of perceived internal respect on flourishing: A sequential mediation of organisational identification and energy. *Cogent Business & Management*, 5(1), 1507276. <https://doi.org/10.1080/23311975.2018.1507276>
- Adil, M. S., & Awais, A. (2016). Effect of leader-member exchange, interpersonal relationship, individual feeling of energy and creative work involvement towards turnover intention: A path analysis using structural equation modeling. *Asian Academy of Management Journal*, 21(2), 99–133. <https://doi.org/10.21315/aamj2016.21.2.5>
- Alarcon, G. M., & Lyons, J. B. (2011). The relationship of engagement and job satisfaction in working samples. *The Journal of Psychology*, 145(5), 463–480. <https://doi.org/10.1080/00223980.2011.584083>
- Allen, T. D., Henderson, T. G., Mancini, V. S., & French, K. A. (2017). Mindfulness and meditation practice as moderators of the relationship between age and subjective wellbeing among working adults. *Mindfulness*, 8(4), 1055–1063. <https://doi.org/10.1007/s12671-017-0681-6>
- Allen, T. D., & Kiburz, K. M. (2012). Trait mindfulness and work–family balance among working parents: The mediating effects of vitality and sleep quality. *Journal of Vocational Behavior*, 80(2), 372–379. <https://doi.org/10.1016/j.jvb.2011.09.002>
- Alparslan, A. M., & Kılınc, U. K. (2015). The power of informal communication and perceived organisational support on energy at work and extra-role behavior: A survey on teachers. *International Journal of Human Sciences*, 12(2), 113–138. <https://doi.org/10.14687/ijhs.v12i2.3243>
- Atwater, L., & Carmeli, A. (2009). Leader–member exchange, feelings of energy, and involvement in creative work. *The Leadership Quarterly*, 20(3), 264–275. <https://doi.org/10.1016/j.leaqua.2007.07.009>
- Baik, S.J., Song, H.-D., & Hong, A.J. (2018). Craft your job and get engaged: Sustainable change oriented behavior at work. *Sustainability*, 10(12), 4404. <https://doi.org/10.3390/su10124404>
- Bakker, A. B., Hakanen, J. J., Demerouti, E., & Xanthopoulou, D. (2007). Job resources boost work engagement, particularly when job demands are high. *Journal of Educational Psychology*, 99(2), 274–284. <https://doi.org/10.1037/0022-0663.99.2.274>
- Bakker, A. B., van Emmerik, H., & Euwema, M. C. (2006). Crossover of burnout and engagement in work teams. *Work and Occupations*, 33(4), 464–489. <https://doi.org/10.1177/0730888406291310>

- Baruch, Y., Grimland, S., & Vigoda-Gadot, E. (2014). Professional vitality and career success: Mediation, age and outcomes. *European Management Journal*, 32(3), 518–527. <https://doi.org/10.1016/j.emj.2013.06.004>
- Ben Hador, B. (2016). How intra-organisational social capital influences employee performance. *Journal of Management Development*, 35(9), 1119–1133. <https://doi.org/10.1108/JMD-12-2015-0172>
- Bhave, D., & Leftner, A. M. (2017). The other side: Occupational interactional requirements and work-home enrichment. *Academy of Management Journal*, 61(1), 139-164. <https://doi.org/10.5465/amj.2016.0369>
- Bilgel, N., Bayram, N., Ozdemir, H., Dogan, F., & Ekin, D. (2012). Work engagement, burnout and vigor among a group of medical residents in Turkey. *British Journal of Education, Society & Behavioural Science*, 2(3), 220–238. <https://doi.org/10.9734/BJESBS/2012/1496>
- Cangiano, F., Parker, S.K., & Yeo, G.B. (2018). Does daily proactivity affect well-being? The moderating role of punitive supervision. *Journal of Organisational Behavior*, 40(1), 59-72. <https://doi.org/10.1002/job.2321>
- Carmeli, A., Ben-Hador, B., Waldman, D. A., & Rupp, D. E. (2009). How leaders cultivate social capital and nurture employee vigor: Implications for job performance. *The Journal of Applied Psychology*, 94(6), 1553–1561. <https://doi.org/10.1037/a0016429>
- Cheng, T., Mauno, S., & Lee, C. (2014). Do job control, support, and optimism help job insecure employees?: A three-wave study of buffering effects on job satisfaction, vigor and work-family enrichment. *Social Indicators Research*, 118(3), 1269–1291. <https://doi.org/10.1007/s11205-013-0467-8>
- Cheng, T., Mauno, S., & Lee, C. (2014). The buffering effect of coping strategies in the relationship between job insecurity and employee well-being. *Economic and Industrial Democracy*, 35(1), 71–94. <https://doi.org/10.1177/0143831X12463170>
- Cinamon, R. G., & Rich, Y. (2009). Work family relations: Antecedents and outcomes. *Journal of Career Assessment*, 18(1), 59–70. <https://doi.org/10.1177/1069072709340661>
- Clinton, M.E., Conway, N., & Sturges, J. (2016). “It’s tough hanging-up a call”: The relationships between calling and work hours, psychological detachment, sleep quality and morning vigor. *Journal of Occupational Health Psychology*, 22(1), 28-39. <http://dx.doi.org/10.1037/ocp0000025>
- Coetzee, M., & Villiers, M. de. (2010). Sources of job stress, work engagement and career orientations of employees in a South African financial institution. *Southern African Business Review*, 14(1), 27–58.
- Cole, M. S., Bruch, H., & Vogel, B. (2012). Energy at work: A measurement validation and linkage to unit effectiveness. *Journal of Organisational Behavior*, 33(4), 445–467. <https://doi.org/10.1002/job.759>

- Coo, C., & Salanova, M. (2017). Mindfulness can make you happy-and-productive: a mindfulness controlled trial and its effects on happiness, work engagement and performance. *Journal of Happiness Studies*, 19(6), 1691-1711. <https://doi.org/10.1007/s10902-017-9892-8>
- Dane, E., & Brummel, B. J. (2013). Examining workplace mindfulness and its relations to job performance and turnover intention. *Human Relations*, 67(1), 105–128. <https://doi.org/10.1177/0018726713487753>
- Demerouti, E., Bakker, A. B., Jonge, J. de, Janssen, P., & Schaufeli, W. B. (2001). Burnout and engagement at work as a function of demands and control. *Scandinavian Journal of Work, Environment & Health*, 27(4), 279–286.
- Demerouti, E., Bakker, A. B., Sonnentag, S., & Fullagar, C. J. (2012). Work-related flow and energy at work and at home: A study on the role of daily recovery. *Journal of Organisational Behavior*, 33(2), 276–295. <https://doi.org/10.1002/job.760>
- Demerouti, E., Mostert, K., & Bakker, A. B. (2010). Burnout and work engagement: a thorough investigation of the independency of both constructs. *Journal of Occupational Health Psychology*, 15(3), 209–222. <https://doi.org/10.1037/a0019408>
- Dubreuil, P., Forest, J., & Courcy, F. (2014). From strengths use to work performance: The role of harmonious passion, subjective vitality, and concentration. *The Journal of Positive Psychology*, 9(4), 335–349. <https://doi.org/10.1080/17439760.2014.898318>
- Dylağ, A., Jaworek, M., Karwowski, W., Kożusznik, M., & Marek, T. (2013). Discrepancy between individual and organisational values: Occupational burnout and work engagement among white-collar workers. *International Journal of Industrial Ergonomics*, 43(3), 225–231. <https://doi.org/10.1016/j.ergon.2013.01.002>
- Elçi, M., Yildiz, B., & Edilek Karabay, M. (2018). How burnout affects turnover intention? The conditional effects of subjective vitality and supervisor support. *International Journal of Organisational Leadership*, 7(1), 47-60. <https://doi.org/10.33844/ijol.2018.60233>
- Engeser, S., & Baumann, N. (2014). Does achievement motivation mediate the semantic achievement priming effect?. *Journal of Experimental Psychology: General*, 143(5), 1861 - 1874. <http://dx.doi.org/10.1037/a0036864>
- Engeser, S., & Baumann, N. (2016). Fluctuation of flow and affect in everyday life: A second look at the paradox of work. *Journal of Happiness Studies*, 17(1), 105–124. <https://doi.org/10.1007/s10902-014-9586-4>
- Erbasi, A., & Ozbek, M. C. (2016). The effect of psychological capital on work engagement. *Australian Academy of Business and Economics Review*, 2(4), 276–284.
- Extremera, N., Mérida-López, S., Sánchez-Álvarez, N., & Quintana-Orts, C., (2018). How does emotional intelligence make one feel better at work? The mediational role of work engagement. *International Journal of Environmental Research and Public Health*, 15(9), 1909. <https://doi.org/10.3390/ijerph15091909>
- Forest, J., Mageau, G. A., Crevier-Braud, L., Bergeron, É., Dubreuil, P., & Lavigne, G. L. (2012). Harmonious passion as an explanation of the relation between signature strengths' use

and well-being at work: Test of an intervention program. *Human Relations*, 65(9), 1233–1252. <https://doi.org/10.1177/0018726711433134>

Forest, J., Mageau, G. A., Sarrazin, C., & Morin, E. M. (2011). “Work is my passion”: The different affective, behavioural, and cognitive consequences of harmonious and obsessive passion toward work. *Canadian Journal of Administrative Sciences / Revue Canadienne Des Sciences De L'Administration*, 28(1), 27–40. <https://doi.org/10.1002/cjas.170>

Geiger, L. Leading towards well-being: Exploring organisational climate, leadership and individual factors that relate to thriving at work (Order No. AAI3565318). Available from Sociological Abstracts; Sociological Abstracts. (1531933734; 201423757). Retrieved from <https://search.proquest.com/docview/1531933734?accountid=14627>

Geue, P.E. (2018). Positive practices in the workplace: Impact on team climate, work engagement, and task performance. *Journal of Applied Behavioral Science*, 54(3), 272-301. <https://doi.org/10.1177/0021886318773459>

Gombert, L., Rivkin, W., & Schmidt, K.-H. (2018). Indirect effects of daily self-control demands on subjective vitality via ego depletion: How daily psychological detachment pays off. *Applied Psychology: An International Review*, 0(0), 1-26. <https://doi.org/10.1111/apps.12172>

Gözükara, I., & Şimşek, Ö. F. (2015). Work engagement as mediator in the relationship between transformational leadership and job satisfaction. *Journal of International Scientific Publications*, 9, 195–202.

Groenewoudt, A. C., Rooks, G., & van Gool, P. J. R. (2017). When problems lead to ideas: The roles of daily vigor and social interactions. *The Journal of Creative Behavior*, 10, 123. <https://doi.org/10.1002/jocb.179>

Hakanen, J.J., Peeters, M.C.W., & Schaufeli, W.B. (2017). Different types of employee well-being across time and their relationships with job crafting. *Journal of Occupational Health Psychology*. 23(2), 289-301. <http://dx.doi.org/10.1037/ocp0000081>

Hakanen, J., Rodriguez-Sánchez, & Perhoniemi, R. (2012). Too good to be true?: Similarities and differences between engagement and workaholism among Finnish judges. *Ciencia y Trabajo*, 72-80.

Hakanen, J. J., Bakker, A. B., & Schaufeli, W. B. (2006). Burnout and work engagement among teachers. *Journal of School Psychology*, 43(6), 495–513. <https://doi.org/10.1016/j.jsp.2005.11.001>

Hakanen, J. J., & Schaufeli, W. B. (2012). Do burnout and work engagement predict depressive symptoms and life satisfaction?: A three-wave seven-year prospective study. *Journal of Affective Disorders*, 141(2-3), 415–424. <https://doi.org/10.1016/j.jad.2012.02.043>

Jackson, L. T. B., Rothmann, S., & van de Vijver, F. J. R. (2006). A model of work-related well-being for educators in South Africa. *Stress and Health*, 22(4), 263–274. <https://doi.org/10.1002/smi.1098>

- Kark, R., & Carmeli, A. (2009). Alive and creating: the mediating role of vitality and aliveness in the relationship between psychological safety and creative work involvement. *Journal of Organisational Behavior*, 30, 785–804.
- Karkkola, P., Kuittinen, M., Hintsala, T., Ryyänen, J., & Simonen, A. (2018). Each one counts: Basic needs mediating the association between social support and vitality at work. *Scandinavian Journal of Work and Organisational Psychology*, 3(1), 1-11. <http://dx.doi.org/10.16993/sjwop.54>
- Kartal, N. (2018). Evaluating the relationship between work engagement, work alienation and work performance of healthcare professionals. *International Journal of Healthcare Management*, 11(3), 251-259. <https://doi.org/10.1080/20479700.2018.1453969>
- Kinnunen, U., & Feldt, T. (2013). Job characteristics, recovery experiences and occupational well-being: Testing cross-lagged relationships across 1 year. *Stress and Health*, 29(5), 369–382. <https://doi.org/10.1002/smi.2483>
- Korpela, K., De Bloom, J., Sianoja, M., Pasanen, T., & Kinnunen, U. (2017). Nature at home and at work: Naturally good? Links between window views, indoor plants, outdoor activities and employee well-being over one year. *Landscape and Urban Planning*, 160, 38-47. <http://dx.doi.org/10.1016/j.landurbplan.2016.12.005>
- Lam, C. F., Spreitzer, G., & Fritz, C. (2014). Too much of a good thing: Curvilinear effect of positive affect on proactive behaviors. *Journal of Organisational Behavior*, 35(4), 530–546. <https://doi.org/10.1002/job.1906>
- Lei, X., Kaplan, S.A., Dye, C.E., & Wong, C.M. (2019). On the subjective experience and correlates of downtime at work: A mixed-method examination. *Journal of Organisational Behavior*, 40(3), 360-381. <https://doi.org/10.1002/job.2336>
- Lisbona, A., Palaci, F., Salanova, M., & Frese, M. (2018). The effects of work engagement and self-efficacy on personal initiative and performance. *Psicothema*, 30(1), 89-96.
- Lin, L., Siu, O.-l., Shi, K., & Bai, X.-w. (2009). Challenge and hindrance job demands, job resource, and their relationships with vigor and emotional exhaustion. In H. Lan (Ed.), *International conference on management science and engineering, 2009: ICMSE 2009 ; 14 - 16 Sept. 2009, Moscow, Russia ; 16th annual conference proceedings* (pp. 1098–1106). Piscataway, NJ: IEEE. <https://doi.org/10.1109/ICMSE.2009.5318129>
- Little, L. M., Nelson, D. L., Wallace, J. C., & Johnson, P. D. (2010). Integrating attachment style, vigor at work, and extra-role performance. *Journal of Organisational Behavior*, 32(3), 464–484. <https://doi.org/10.1002/job.709>
- Llorens, S., Bakker, A. B., Schaufeli, W. B., & Salanova, M. (2006). Testing the robustness of the job demands-resources model. *International Journal of Stress Management*, 13(3), 378–391. <https://doi.org/10.1037/1072-5245.13.3.378>
- Llorens, S., Schaufeli, W. B., Bakker, A. B., & Salanova, M. (2007). Does a positive gain spiral of resources, efficacy beliefs and engagement exist? *Computers in Human Behavior*, 23(1), 825–841. <https://doi.org/10.1016/j.chb.2004.11.012>

- Lysova, E. I., Khapova, S. N., & Jansen, P. G. W. (2016). Vigor as a positive personal resource: The effect of vigor gains and losses on organisational commitment. VU University Amsterdam, Amsterdam, Netherlands. Unpublished received 2016
- Mackey, J. D., Perrewé, P. L., & McAllister, C. P. (2017). Do I fit in?: Perceptions of organisational fit as a resource in the workplace stress process. *Group & Organisation Management*, 42(4), 455–486. <https://doi.org/10.1177/1059601115625155>
- Malik, O.F., Schat, A.C.H., Shahzad, A., Raziq, M.M., & Faiz, R. (2018). Workplace psychological aggression, job stress, and vigor: A test of longitudinal effects. *Journal of Interpersonal Violence*. <https://doi.org/10.1177/0886260518770650>
- Martela, F., & Ryan, R. M. (2016). Prosocial behavior increases well-being and vitality even without contact with the beneficiary: Causal and behavioral evidence. *Motivation and Emotion*, 40(3), 351–357. <https://doi.org/10.1007/s11031-016-9552-z>
- Martínez-Martí, M. L., & Ruch, W. (2014). Character strengths and well-being across the life span: Data from a representative sample of German-speaking adults living in Switzerland. *Frontiers in Psychology*, 5, 1-10. <https://doi.org/10.3389/fpsyg.2014.01253>
- Mauno, S., Kinnunen, U., & Ruokolainen, M. (2007). Job demands and resources as antecedents of work engagement: A longitudinal study. *Journal of Vocational Behavior*, 70(1), 149–171. <https://doi.org/10.1016/j.jvb.2006.09.002>
- Mauno, S., & Ruokolainen, M. (2017). Does organisational work–family support benefit temporary and permanent employees equally in a work–family conflict situation in relation to job satisfaction and emotional energy at work and at home? *Journal of Family Issues*, 38(1), 124–148. <https://doi.org/10.1177/0192513X15600729>
- Meier, G. (2016). Adaptive und maladaptive Bewältigungsstrategien im Umgang mit direkter Unternehmenssteuerung. Fachhochschule Nordwestschweiz, Olten, Schweiz. Unpublished.
- Metin, U.B., Peeters, M.C.W., & Taris, T.W. (2018). Correlates of procrastination and performance at work: The role of having „good fit“. *Journal of Prevention & Intervention in the Community*, 46(3), 228-244. <https://doi.org/10.1080/10852352.2018.1470187>
- Mills, M. J., Culbertson, S. S., & Fullagar, C. J. (2011). Conceptualizing and measuring engagement: An analysis of the utrecht work engagement scale. *Journal of Happiness Studies*, 13(3), 519–545. <https://doi.org/10.1007/s10902-011-9277-3>
- Mills, M. J., & Fullagar, C. J. (2017). Engagement within occupational trainees: Individual difference predictors and commitment outcome. *Journal of Vocational Behavior*, 98, 35–45. <https://doi.org/10.1016/j.jvb.2016.09.004>
- Moazami-Goodarzi, A., Nurmi, J.-E., Mauno, S., & Rantanen, J. (2015). Cross-lagged relations between work-family enrichment, vigor at work, and core self-evaluations: A three-wave study. *Journal of Business and Psychology*, 30(3), 473–482. <https://doi.org/10.1007/s10869-014-9376-3>

- Montgomery, A. J., Peeters, M. C. W., Schaufeli, W. B., & Den Ouden, M. (2003). Work-home interference among newspaper managers: Its relationship with burnout and engagement. *Anxiety, Stress & Coping*, 16(2), 195–211. <https://doi.org/10.1080/1061580021000030535>
- Ohly, S., Göritz, A.S., & Schmitt, A. (2017). The power of routinized task behavior for energy at work. *Journal of Vocational Behavior*, 103(B), 132-142. <https://doi.org/10.1016/j.jvb.2017.08.008>
- Owens, B. P., Baker, W. E., Sumpter, D. M., & Cameron, K. S. (2016). Relational energy at work: Implications for job engagement and job performance. *The Journal of Applied Psychology*, 101(1), 35–49. <https://doi.org/10.1037/apl0000032>
- Parzefall, M.-R., & Hakanen, J. (2010). Psychological contract and its motivational and health-enhancing properties. *Journal of Managerial Psychology*, 25(1), 4–21. <https://doi.org/10.1108/02683941011013849>
- Peterson, C., Park, N., Hall, N., & Seligman, M. E. P. (2009). Zest and work. *Journal of Organisational Behavior*, 30, 161–172.
- Prem, R., Ohly, S., Kubicek, B., & Korunka, C. (2017). Thriving on challenge stressors? Exploring time pressure and learning demands as antecedents of thriving at work. *Journal of Organisational Behavior*, 38(1), 108–123. <https://doi.org/10.1002/job.2115>
- Raes, A. M. L., Bruch, H., & de Jong, S. B. (2012). How top management team behavioural integration can impact employee work outcomes: Theory development and first empirical tests. *Human Relations*, 66(2), 167–192. <https://doi.org/10.1177/0018726712454554>
- Reijseger, G., Peeters, M. C. W., Taris, T. W., & Schaufeli, W. B. (2016). From motivation to activation: Why engaged workers are better performers. *Journal of Business and Psychology*, 32(2), 117–130. <https://doi.org/10.1007/s10869-016-9435-z>
- Reis, D., Hoppe, A., Arndt, C., & Lischetzke, T. (2016). Time pressure with state vigour and state absorption: Are they non-linearly related? *European Journal of Work and Organisational Psychology*, 26(1), 94–106. <https://doi.org/10.1080/1359432X.2016.1224232>
- Rivkin, W., Diestel, S., & Schmidt, K.-H. (2016). Which daily experiences can foster well-being at work? A diary study on the interplay between flow experiences, affective commitment, and self-control demands. *Journal of Occupational Health Psychology*, 23(1), 99-111. <http://dx.doi.org/10.1037/ocp0000039>
- Rodríguez-Carvajal, R., Herrero, M., van Dierendonck, D., de Rivas, S., & Moreno-Jiménez, B. (2019). Servant leadership and goal attainment through meaningful life and vitality: A diary study. *Journal of Happiness Studies*, 20(2), 499-521. <https://doi.org/10.1007/s10902-017-9954-y>
- Rodriguez-Munoz, A., Moreno-Jimenez, B., & Sanz-Vergel, A. I. (2015). Reciprocal relations between workplace bullying, anxiety, and vigor: A two-wave longitudinal study. *Anxiety, Stress & Coping*, 28(5), 514–530. <https://doi.org/10.1080/10615806.2015.1016003>

- Salanova, M., & Schaufeli, W. B. (2008). A cross-national study of work engagement as a mediator between job resources and proactive behaviour. *The International Journal of Human Resource Management*, 19(1), 116–131. <https://doi.org/10.1080/09585190701763982>
- Salminen, S. R., Mäkikangas, A., & Feldt, T. (2014). Job resources and work engagement: Optimism as moderator among Finnish managers. *Journal of European Psychology Students*, 5(1), 69–77. <https://doi.org/10.5334/jeps.bu>
- Sanz-Vergel, A. I., Demerouti, E., Bakker, A. B., & Moreno-Jiménez, B. (2011). Daily detachment from work and home: The moderating effect of role salience. *Human Relations*, 64(6), 775–799. <https://doi.org/10.1177/0018726710393368>
- Sanz-Vergel, A. I., & Rodríguez-Muñoz, A. (2013). The spillover and crossover of daily work enjoyment and well-being: A diary study among working couples. *Journal of Work and Organisational Psychology*, 29(3), 179–185. <https://doi.org/10.5093/tr2013a24>
- Schaufeli, W. B., & Bakker, A. B. (2004). Job demands, job resources, and their relationship with burnout and engagement: A multi-sample study. *Journal of Organisational Behavior*, 25, 293–315.
- Schaufeli, W. B., Bakker, A. B., & van Rhenen, W. (2009). How changes in job demands and resources predict burnout, work engagement, and sickness absenteeism. *Journal of Organisational Behavior*, 30(7), 893–917. <https://doi.org/10.1002/job.595>
- Schaufeli, W. B., & Salanova, M. (2001). The measurement of engagement and burnout: A two sample confirmatory factor analytic approach. *Journal of Happiness Studies*, 3, 71–92.
- Schaufeli, W. B., Taris, T. W., & van Rhenen, W. (2008). Workaholism, burnout, and work engagement: Three of a kind or three different kinds of employee well-being? *Applied Psychology*, 57(2), 173–203. <https://doi.org/10.1111/j.1464-0597.2007.00285.x>
- Schmitt, A., Belschak, F. D., & Den Hartog, D. N. (2017). Feeling vital after a good night's sleep: The interplay of energetic resources and self-efficacy for daily proactivity. *Journal of Occupational Health Psychology*, 22(4), 443–454. <https://doi.org/10.1037/ocp0000041>
- Selenko, E., Mäkikangas, A., Mauno, S., & Kinnunen, U. (2013). How does job insecurity relate to self-reported job performance?: Analysing curvilinear associations in a longitudinal sample. *Journal of Occupational and Organisational Psychology*, 86(4), 522–542. <https://doi.org/10.1111/joop.12020>
- Shefer, N., Carmeli, A., Cohen-Meitar, R. (2018). Bringing Carl Rogers back in: Exploring the power of positive regard at work. *British Journal of Management*, 29(1), 63–81. <https://doi.org/10.1111/1467-8551.12247>
- Shirom, A., Toker, S., Berliner, S., Shapira, I., & Melamed, S. (2008). The effects of physical fitness and feeling vigorous on self-rated health. *Health Psychology*, 27(5), 567–575. <https://doi.org/10.1037/0278-6133.27.5.567>
- Shusha, A. A. (2016). Work engagement in higher education in Egypt: The influence on academic work performance. *International Journal of Performance Management*, 17(2), 132–146.

- Smith, M. R., Rasmussen, J. L., Mills, M. J., Wefald, A. J., & Downey, R. G. (2012). Stress and performance: Do service orientation and emotional energy moderate the relationship? *Journal of Occupational Health Psychology, 17*(1), 116–128. <https://doi.org/10.1037/a0026064>
- Sonnentag, S., Binnewies, C., & Mojza, E. J. (2008). “Did you have a nice evening?”: A day-level study on recovery experiences, sleep, and affect. *Journal of Applied Psychology, 93*(3), 674–684.
- Sonnentag, S., & Niessen, C. (2008). Staying vigorous until work is over: The role of trait vigour, day-specific work experiences and recovery. *Journal of Occupational and Organisational Psychology, 81*(3), 435–458. <https://doi.org/10.1348/096317908X310256>
- Stevens, S. N. M. (2010). Understanding how employees unwind after work: Expanding the construct of "recovery". Saint Mary's University, Halifax, Nova Scotia.
- Stillman, T. F., Baumeister, R. F., Vohs, K. D., Lambert, N. M., Fincham, F. D., & Brewer, L. E. (2010). Personal philosophy and personnel achievement: Belief in free will predicts better job performance. *Social Psychological and Personality Science, 1*(1), 43–50. <https://doi.org/10.1177/1948550609351600>
- Stoeber, J., Townley, J., & Davis, C. R. (2013). Comparing two work-engagement scales: Relationships with job satisfaction, organisational commitment, and workaholism. Canterbury, Kent: School of Psychology, University of Kent.
- Ten Brummelhuis, L. L., & Bakker, A. B. (2012b). Staying engaged during the week: The effect of off-job activities on next day work engagement. *Journal of Occupational Health Psychology, 17*(4), 445–455. <https://doi.org/10.1037/a0029213>
- Tims, M., Bakker, A. B., Derks, D., & van Rhenen, W. (2013). Job crafting at the team and individual level. *Group & Organisation Management, 38*(4), 427–454. <https://doi.org/10.1177/1059601113492421>
- Tinguely, P., Ben-Menahem, S., He, F. & von Krogh, G. Innovation under Time Pressure: The Pivotal Role of Temporal Leadership and Employees' Human Energy. Israel Organisational Behavior Conference in Tel Aviv, Israel, January, 2018.
- Tummers, L., Steijn, B., Nevicka, B., & Heerema, M. (2018). The effects of leadership and job autonomy on vitality: Survey and experimental evidence. *Review of Public Personnel Administration, 38*(3), 355-377. <https://doi.org/10.1177/0734371X16671980>
- Van den Bosch, R., Taris, T.W., Schaufeli, W.B., Peeters, M.C.W., & Reijseger, G. (2019). Authenticity at Work: A Matter of Fit? *Journal of Psychology, 153*(2), 247-266. <https://doi.org/10.1080/00223980.2018.1516185>
- Van Hooff, M. L. M., & Geurts, S. A. E. (2015). Need satisfaction and employees' recovery state at work: A daily diary study. *Journal of Occupational Health Psychology, 20*(3), 377–387. <https://doi.org/10.1037/a0038761>

- Van Hooff, M. L. M., & de Pater, I. E. (2017). Let's have fun tonight: The role of pleasure in daily recovery from work. *Applied Psychology*, 66(3), 359–381. <https://doi.org/10.1111/apps.12098>
- Van Katwyk, P. T., Fox, S., Spector, P. E., & Kelloway, E. K. (2000). Using the job-related affective well-being scale (JAWS) to investigate affective responses to work stressors. *Journal of Occupational Health Psychology*, 5(2), 219–230.
- Van Scheppingen, A. R., de Vroome, E. M. M., ten Have, K. C. J. M., Zwetsloot, G. I. J. M., Wiezer, N., & van Mechelen, W. (2015). Vitality at work and its associations with lifestyle, self-determination, organisational culture, and with employees' performance and sustainable employability. *Work*, 52(1), 45–55. <https://doi.org/10.3233/WOR-141947>
- Vansteenkiste, M., Neyrinck, B., Niemiec, C. P., Soenens, B., Witte, H., & Broeck, A. (2007). On the relations among work value orientations, psychological need satisfaction and job outcomes: A self-determination theory approach. *Journal of Occupational and Organisational Psychology*, 80(2), 251–277. <https://doi.org/10.1348/096317906X111024>
- Van Wingerden, J., Derks, D., & Bakker, A.B. (2018). Facilitating interns' performance: The role of job resources, basic need satisfaction and work engagement. *Career Development International*, 22(4), 382-396. <https://doi.org/10.1108/CDI-12-2017-0237>
- Van Wingerden, J., & Van der Stoep, J. (2018). The motivational potential of meaningful work relationships with strengths use, work engagement, and performance. *PLOS ONE*, 13(6). <https://doi.org/10.1371/journal.pone.0197599>
- Vecina, M. L., & Chacón, F. (2013). Is engagement different from satisfaction and organisational commitment?: Relations with intention to remain, psychological well-being and perceived physical health in volunteers. *Anales De Psicología*, 29(1). <https://doi.org/10.6018/analesps.29.1.161861>
- Voltmer, J.-B., Voltmer, E., & Deller, J. (2018). Differences of four work-related behavior and experience patterns in work ability and other work-related perceptions in a finance company. *International Journal of Environmental Research and Public Health*, 15(7), 1521. <https://doi.org/10.3390/ijerph15071521>
- Wefald, A. J. (2008). An examination of job engagement, transformational leadership and related psychological constructs. Kansas State University, Manhattan, Kansas.
- White, E. (2010). Helping to promote psychological well-being at work: The role of work engagement, work stress and psychological detachment using the job demands-resources model. *The Plymouth Student Scientist*, 4(2), 155–180.
- Wohlers, C., Hartner-Tiefenthaler, M., & Hertel, G. (2019). The relation between activity-based work environments and office workers' job attitudes and vitality. *Environment and Behavior*, 51(2), 167–198. <https://doi.org/10.1177/0013916517738078>
- Wolter, C (2016). German police officers. Unpublished.

Wu, C.M., Pai, T. I., Chen, T.J., Lin, C.C., & Chen, S.H. (2018). Promoting change-oriented organisational citizenship behavior: The role of social support and thriving. *Science Journal of Business and Management*, 6(2), 32-37. <https://doi.org/10.11648/j.sjbm.20180602.11>

Appendix B: Example Critical Incident Description for Internal Interruptions Study 2a.

Bitte berichten Sie nun von einer Situation, in der Sie eine Aufgabe bearbeiteten, sich dann jedoch während dieser Tätigkeit **selbst unterbrochen** haben.

Falls Sie aktuell nicht berufstätig sind, wählen Sie eine Situation aus Ihrem letzten Arbeitsverhältnis oder eine vergleichbare Situation. Als Student können Sie das zuletzt absolvierte Praktikum oder das Lernen für eine Klausur verwenden.

Wichtig:

Hier sollen Sie eine Situation beschreiben, in der **Sie sich selbst bei Ihrer derzeitigen Arbeitsaufgabe unterbrochen** haben.

Dies kann zum Beispiel...

- das Überprüfen von E-Mails
- ein Blick aufs Handy
- das tätigen eines Anrufs
- das Abbrechen einer Arbeitsaufgabe
- der Wechsel zu einer anderen Arbeitsaufgabe
- das Fortsetzen einer wichtigen privaten Aufgabe
- das Öffnen und Schließen eines Fensters / einer Tür
- das Kochen eines Kaffees
- der Gang zu einem Kollegen

oder etwas ganz anderes sein.

Bitte erinnern Sie sich nun an eine solche Situation, in der Sie sich selbst unterbrochen haben. Versuchen Sie sich so gut es geht noch einmal in diese Situation hineinzusetzen.

Bitte versuchen Sie, sich so genau wie möglich in die Situation hineinzusetzen und die Situation so detailliert wie möglich zu beschreiben.

- 1) Beginnen Sie damit die Aufgaben, Ihre Ziele und Ihr Verhalten in der Situation zu beschreiben.**

Was waren Ihre Aufgaben in der Situation? Was war Ihr Ziel? Was haben Sie in der Situation gemacht? etc.

- 2) Um was für eine Situation hat es sich gehandelt? Wie war die Umgebung in der Situation?**

Wo befanden Sie sich? Waren andere Personen anwesend? Wie war Ihre Umgebung? War es laut oder leise? etc.

- 3) Wie haben Sie sich in der Situation gefühlt und was haben Sie wahrgenommen?**

Was haben Sie gedacht und wahrgenommen? Wie haben Sie sich dabei gefühlt? Waren Sie gelangweilt oder interessiert, glücklich oder traurig?

Appendix C: Example instructions for study 3b

Liebe Teilnehmerinnen & Teilnehmer,

vielen Dank für die Teilnahme an unserem Assessment-Center Training.

Bevor das eigentliche Experiment beginnen kann, bitten wir Sie im Vorfeld einige Fragen über Ihre Person und Ihr aktuelles Befinden zu beantworten. Bitte beantworten Sie alle Fragen vollständig!

Im Anschluss daran werden Sie eine Postkorbaufgabe bearbeiten, um den Umgang mit solchen Aufgaben zu üben. Hierzu bekommen Sie gleich noch weitere Informationen. Die Bearbeitung der Aufgabe wird ca. 30 Minuten in Anspruch nehmen. Zusätzlich wird Ihnen eine weitere Aufgabe mit einer Dauer von 5 Minuten gestellt, sodass die gesamte Aufgabenbearbeitung insgesamt 35 Minuten dauern wird.

Abschließend werden wir Ihnen nochmal ein paar Fragen über Ihre Erfahrungen mit der Postkorbaufgabe und Ihr aktuelles Befinden stellen. Die gesamte Teilnahmedauer beträgt ca. 45 Minuten.

Wenn Sie beide Aufgaben vollständig bearbeiten, erhalten Sie von uns eine Aufwandsentschädigung in Höhe von 6€ und auf Wunsch eine Rückmeldung über Ihre Leistung in der Postkorbaufgabe.

Alle erhobenen Daten werden selbstverständlich anonym und streng vertraulich behandelt. Sie werden nur zu Forschungszwecken im Rahmen dieses Projekts ausgewertet und nicht an Dritte weitergegeben.

Assessment Center sind für Bewerbungen weit verbreitet. Dabei finden sie zunehmend nicht nur für Führungspositionen, sondern auch im Rahmen von Trainee-Bewerbungen statt. Mit ACs sind in der Regel ganztägige Veranstaltungen gemeint, bei denen die Bewerber verschiedene Aufgaben durchlaufen. Eine der am häufigsten verwendeten Aufgaben ist die so genannte Postkorb-Aufgabe. Dabei müssen die Bewerber verschiedene Dokumente und/oder Termine koordinieren. Die gute Nachricht: Übung macht hier den Meister! Eine solche Postkorbaufgabe möchten wir daher heute mit Ihnen üben. Die Forschung hat in den letzten Jahren verschiedene Strategien zur Bearbeitung erforscht.

[Internal Interruption Group] Laut dieser wissenschaftlichen Studien steigert sich die Leistung bei Postkorbaufgaben, wenn man sich zu einem selbst gewählten Zeitpunkt kurz mit einer anderen Aufgabe beschäftigt. Dabei ist es besonders sinnvoll diesen Aufgabenwechsel vorzunehmen, wenn man nicht sofort weiter weiß oder wenn man sich unsicher ist, ob das gewählte Vorgehen zielführend ist. Daher möchten wir Sie dazu anhalten, sich so lange komplett auf die Postkorbaufgabe zu konzentrieren, bis einer der beiden Fälle eintritt oder bis Sie das Bedürfnis verspüren kurz etwas anderes zu machen. Klicken Sie dann bitte auf den „Weiter“ Button, der Ihnen rechts unten angezeigt wird, um zu einer anderen Aufgabe zu wechseln. Ihr Fortschritt bei der Postkorbaufgabe wird automatisch für Sie im Fragebogen gespeichert. Damit Sie in der Zwischenzeit nicht abgelenkt werden, setzen Sie bitte jetzt die bereitliegenden Kopfhörer auf.

[ALL] Auch die zweite Aufgabe, ist eine typische Assessment Center Aufgabe. Daher lohnt es sich ebenfalls, diesen Aufgabentyp zur Vorbereitung auf ein Assessment Center zu üben.

Für unsere Forschung ist es wichtig, ein paar Dinge über Sie zu erfahren. Daher bitten wir Sie darum, die Fragen, die wir Ihnen vor und nach der Postkorbaufgabe stellen, ernsthaft zu beantworten. Sie können nun mit der Bearbeitung beginnen!

Bitte lesen Sie jetzt die Instruktion für die Postkorbaufgabe. Diese liegt in einem Ordner mit der Aufschrift „Postkorbaufgabe“ auf Ihrem Tisch. Sobald Sie die Instruktion gelesen haben, drücken Sie hier im Fragebogen auf „Weiter“ (unten rechts). Lesen Sie bitte die Instruktion vollständig, bevor Sie auf „Weiter“ Klicken. Die Bearbeitungszeit für die Postkorbaufgabe beginnt, wenn Sie auf „Weiter“ geklickt haben.

Den Stadtplan, den Sie zur Bearbeitung der Postkorbaufgabe benötigen, finden Sie ebenfalls auf der nächsten Seite dieses Fragebogens. Bitte schreiben Sie keinerlei Notizen oder Anmerkungen in die Instruktion der Postkorbaufgabe. Für Ihre handschriftlichen Notizen liegen im Ordner leere Din A 4 Blätter, die Sie gerne dafür verwenden können.

- a) [Internal Interruption Group] Wir möchten Sie jetzt noch einmal an die Forschungsergebnisse erinnern, die besagen, dass Sie die beste Leistung erzielen, wenn Sie sich kurz mit einer anderen Aufgabe beschäftigen, wenn Sie nicht direkt weiterwissen, sich unsicher sind oder das Bedürfnis verspüren kurz etwas anderes zu machen. Bitte wechseln Sie mit dem „Weiter“ Button, der Ihnen während der Postkorbaufgabe rechts unten angezeigt wird, zu einer anderen Aufgabe. Nutzen Sie diese Möglichkeit, um möglichst gut abzuschneiden.
-

Eidesstattliche Erklärung

Hiermit versichere ich, dass ich die vorliegende Dissertation selbständig, ohne unerlaubte Hilfe Dritter angefertigt und andere als die in der Dissertation angegebenen Hilfsmittel nicht benutzt habe. Alle Stellen, die wörtlich oder sinngemäß aus veröffentlichten oder unveröffentlichten Schriften entnommen sind, habe ich als solche kenntlich gemacht. Dritte waren an der inhaltlichen Erstellung der Dissertation nicht beteiligt; insbesondere habe ich nicht die Hilfe eines kommerziellen Promotionsberaters in Anspruch genommen. Kein Teil dieser Arbeit ist in einem anderen Promotions- oder Habilitationsverfahren durch mich verwendet worden.

Ann-Kathrin Maria Elisabeth Seipp

Kassel, November 2019