MASTERARBEIT | MASTER'S THESIS

Titel | Title

Feeling Bored? The bidirectional relationship between the basic psychological needs and boredom at work.

verfasst von | submitted by

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angestrebter akademischer Grad | in partial fulfilment of the requirements for the degree of

Master of Science (MSc)

Wien | Vienna, 2024

Studienkennzahl lt. Studienblatt | Degree programme code as it appears on the student record sheet:	UA 066 840
Studienrichtung lt. Studienblatt | Degree programme as it appears on the student record sheet:	Masterstudium Psychologie
Betreut von | Supervisor:	Univ.-Prof. Dr. Christian Korunka

Abstract

Boredom is a negative emotional state, with a broad body of research stretching far back in time. Boredom at work, though not a new concept, has been neglected in research when compared to the entire boredom literature, especially when regarding its negative effect on individuals and organizations, including lower well-being, lower life-satisfaction, lower job satisfaction and higher absence rates. Moreover, recent advancements in motivational theories, such as the self-determination theory (SDT), provide a theoretical framework of how boredom and need satisfaction could be interlinked. Basic psychological needs theory, a mini theory of SDT, poses that the satisfaction of three basic psychological needs for autonomy, competence, and relatedness predict motivation, well-being, and productivity. Using a cross-lagged-panel-modelling approach, this paper investigates the bidirectional relationship between the two constructs to shed more light on both topics and possibly find a way to benefit employees and organizations dealing with boredom and increasing need satisfaction. Ninety-five employees working at least twenty hours a week participated in an online daily diary study. Contrary to what was hypothesized, no negative relationship was found between boredom and basic psychological needs, regardless of the direction of influence. When looking at active coping as a moderator, not effect on the relationship has been found. Implications of these findings are discussed.

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Introduction

'I felt like I had nothing to do and no way to find something to do' said Peter Conrads' (1997) student, talking about a slow Saturday evening when describing his being bored. Everyone experiences boredom in their leisure time, and although boredom cannot always be looked at in a bad way, as it can foster creativity, motivate us to seek out novel experiences and promote well-being (Mann & Cadman, 2014; Bench & Lench, 2019 ; Elpidorou, 2017), the negative effects outweigh the positive ones, especially in a work environment. Rothlin & Werder (2008) went as far as coining the term 'boreout' which is a combination of 'boredom' and 'burnout' and hints at the detrimental effects that boredom can have.

Boredom at work refers to a negative and deactivating, activity-related emotion, that is experienced by employees, as a result of work activities that have negative intrinsic value (Van der Heijden et al., 2012; Van Hooft & Van Hooff, 2014; Spanouli et al., 2023). It is a relatively common phenomenon, which has an estimated prevalence of 15% - 87% of the workforce feeling bored at least sometimes during work (Fisher, 1993; Mann, 2007; Van der Heijden et al., 2012). Boredom at work is not only seen in what are generally considered to be low-complexity, highly monotonous jobs but also in, for example, white-collar jobs (Van der Heijden et al., 2012). This might be the result of the ever-increasing educational level but also the technological advancements, which bring with them routinization of even highly complex work, which in turn makes the workers' skills exceed the requirements of their jobs (Loukidou et al., 2009).

SDT is a theory of motivation (Deci & Ryan, 2017). Gagne & Deci (2005) introduced its relevance to the workplace, mainly focusing on the effect of intrinsic and autonomous extrinsic motivation on employees, which includes satisfaction, performance, well-being in the workplace, and trust. Not only is motivation important in the workplace but also the fulfilment of the aforementioned psychological needs. Those do not only predict internalization, which is part of the process of extrinsic motivation becoming autonomous, but also psychological growth and well-being (Van den Broeck et al. 2016; Tang et al. 2020).

The connection between boredom and the satisfaction of psychological needs, though not explicitly stated in it, emerges as early as the then-unprecedented article by

Fisher (1993), which was the first of its kind to address boredom at work and its implications on workers, comprehensively.

Although most of the research points one way, the directionality of the relationship, mainly because it has not been explicitly looked at, remains uncertain (Fisher, 1993; Eastwood et al., 2012; Van Hooff & Van Hooft, 2016,2017). This is especially clear in Uanue et al.'s (2023) recent research, in which they try to clarify the link between affect, in this case positive affect, and psychological need satisfaction with two studies. In the first study, they look at the fulfilment of basic psychological needs and subsequent fluctuations in positive affect and vice versa, over a long period of time (two years). The study yielded a positive effect of the basic psychological needs on positive affect, but not of positive affect on the basic psychological needs. The second study, looking at the same relationship in a different culture and timeframe (two months) showed a bidirectional relationship between the fulfilment of basic psychological needs and positive affect. As the first of its kind, these studies seem to more fully support the direction of need satisfaction bringing forth positive affect, that the other way around.

Based on this rationale, this study aims to examine the relationship between job boredom and the fulfilment of the three basic psychological needs, proposed by the Basic Psychological Needs Theory (BPNT), one of the six mini-theories of the Self-Determination Theory (SDT), namely: Autonomy, competence, and relatedness (Deci & Ryan, 2000).

Most of the studies that have looked at boredom at the workplace in the past have focused on examining the between-person and between-job differences of boredom, meaning trait boredom and its correlates (Spanouli et al. 2023). Studying within-person differences in boredom in addition to between-person variability is, however, crucial. It provides a deeper understanding of boredom as both a near-constant trait and a fluctuating state. This approach aids to uncover how boredom influences daily work experiences and prevents us from missing essential information (Hamaker, 2012; Spanouli et al. 2023).

Accordingly, this study adds to the literature by examining the relationship of the basic psychological needs and boredom at work. The data is collected in a daily diary format and analyzed utilizing a cross lagged design. Additionally, this study looks at the influence of active coping on the relationship between boredom at work and need satisfaction. The study aims at clarifying whether the fulfilment of basic psychological need influences the experience of boredom at work or vice versa. It yields further understanding on how these

two constructs interact on a day to day basis. Overall, the results help us comprehend the dynamic relationship between psychological well-being and boredom at work.

Theoretical Background

Boredom

Boredom has been researched by many different disciplines, including economics, neuroscience, animal cognition, philosophy, and various psychological subfields (developmental, educational, organizational and clinical psychology) (Westgate & Steidle, 2020), there have been several attempts on defining boredom (Fisher 1993; Mikulas & Vodanovic, 1993; Martin et al., 2012) and several attempts at distilling a cohesive definition out of the various existing ones (Smith 1981; Belton & Priyadharshini, 2007; Vodanovich, 2003). The only conclusion was that boredom as a concept is ambiguous. Vogel-Walcutt et al. (2011) stated that state boredom can be defined as a "two-dimensional […] unpleasant (subjective), low-arousal (objective) experience". Westgate & Wilson (2018) on the other hand connect boredom to "unsuccessful attentional engagement in valued goal-congruent activity". The ambivalence of the definitions of boredom makes more sense when looked at under the lens of emotions as component-based constructs (Scherer, 2009). Goetz et al. 2014 illustrate this in their qualitative study where they experience-sample boring experiences from their participants and extract the following different types of boredom: boredom in affect (an unpleasant feeling); boredom in cognition (time passing more slowly); boredom as an expression (mimic and gestures); boredom in motivation (motivation to alter the bored state) and boredom in physiology (the altered arousal), most of which were also argued for by others (Bench & Lench, 2013).

Boredom, as it is with every other emotion, has always been experienced. Nevertheless, there seems to be a trend, that boredom is increasing, at-least in western adolescents (Weybright et al., 2020). New findings link boredom not only to a low state of arousal, but also to overstimulation, more often than not caused by excessive technology use as maladaptive coping mechanism to escape anxiety, which also hints at the need for differentiation between transitory and pathological experiences of boredom (Elpidorou, 2017; Westgate & Wilson 2018; Farooqui & Raquib, 2020). This highlights the point of unsuccessful attentional engagement proposed by Westage & Wilson (2018). They argue that, although the individual tries to engage in a given task, the attention cannot be held,

because of either too high or too low of a challenge, or the salience of any given distractor, may that be a phone, or just a thought perceived as more interesting or stimulating than the task at hand.

Boredom has been associated with various negative effects, for example a decline in effort and motivation (Pekrun et al., 2010), higher absence rates at work (Reijseger et al., 2013, Van Hooff & Van Hooft, 2018), depressed symptoms (Game, 2007; Vodanovich, 2000; Van Hooff & Van Hooft, 2014, 2016) and counterproductive behaviour (Van Hooff & Van Hooft, 2014, 2018), among other negative outcomes (Van Hooff & Van Hooft, 2018). While generally labelled as a negative emotion, boredoms consequences can be positive. Boredom can, for example, promote well-being by adding to the experience of personal growth and flourishing and the (re)construction of a life that has meaning (Elpidorou, 2017). Boredom can additionally lead to the seeking of new experiences, by shifting the attention from the boring task to a new, more arousing experience, which can be negative or positive (Bench & Lench, 2013, 2019). The experience of boredom also helps with the creation of novel ideas, by fostering unintentional mind-wandering and creativity (Orwig et al., 2023; Fox & Beaty, 2019; Mann & Cadman, 2014).

While boredom, as illustrated above, clearly is a very complex and ambiguous concept, the goal of this study is to look at boredom in the context of work and organizations. Although boredom itself has a very broad body of research in various fields, boredom at work, or job-boredom only make up a fraction of the boredom-literature, with only *2.3%* in the last 25 years (WOS-CC, 2024). Additionally, the focus will be on boredom in its predominant negative understanding. Therefore, in accord with and following Fisher (1993), Perkun et al. (2010) and Van Hooft & Van Hooff (2014), I define boredom at work as ‘a profound negative (i.e. unpleasant, dissatisfying) and deactivating (low-arousal) activity-related emotion, implying that employees’ work activities have negative intrinsic value’.

When individuals are confronted with stressful situations during the day, they tend to think about and ruminate on them at night. After a good night’s sleep, these stressors and experienced challenges may still influence how an individual feels, so they are associated with the mood on the following day (Barnes et al., 2021). Not only stress and challenges ‘carry-over’ to affect the next day, but negative affect/emotions and emotion regulation do so as well (Wang et al., 2024).

Since boredom is a recurring negative emotion, especially in the context of work, this study tries to investigate if it has a 'carry-over' effect, meaning that boredom at work on one day positively correlates to boredom felt on a subsequent day. Van Hooff & Van Hooft (2017) looked at the spill over of work-related boredom and found it to be significant and fully mediated through intrinsic motivation and unfavourable prework attitude. In order to confirm their findings of boredom on the previous day relating to boredom on the next day, the following hypothesis is postulated:

Hypothesis 1: Experiencing boredom at work positively relates to experiencing boredom at work the next day.

Self Determination Theory

Research of psychological needs goes far back in time. The first real framework of needs and how they must be met, for the individual's well-being and growth, can be ascribed to Abraham Maslow (1943) and his hierarchy of needs. Even this first representation of needs was not a 'theory of needs' but, as the name of Maslow's foundational paper obviously states 'A Theory of Human Motivation'.

Since Maslow there have been many attempts to postulate integrative theories of motivation, for example McClelland's (1965) theory of motive acquisition, or Victor Vroom's (1964) expectancy theory. At the end of the twentieth century, a new theory of motivation has emerged, namely the self-determination theory (SDT) (Deci & Ryan, 2000). Starting solely as a motivational theory, the SDT evolved to become a broad theory of motivation, development, wellness, and personality (Ryan, 2019), with a total of six sub-theories.
One of those theories is the basic psychological needs theory (BPNT). The BPNT proposes that, just like each individual has physical needs (e.g., sleep, sex and hunger), they also have psychological needs that they want met (Vansteenkiste et al., 2020). A psychological need is understood as "a psychological nutrient that is essential for individuals' adjustment, integrity, and growth" (Ryan, 1995). While the satisfaction of basic psychological needs is highly relevant for wellness, their thwarting leads to illbeing (Ryan, 2019). BPNT suggests "that each basic psychological need uniquely predicts psychological growth, internalization and well-being." (Van den Broeck et al., 2016).

Up until now (Vansteenkiste et al., 2020), three basic psychological needs haven been identified: Autonomy, competence and relatedness. Autonomy, as defined by SDT, refers to the individuals' need for psychological freedom and a sense of control over one's own behaviour, or rather the feeling that one can act on one's own volition (Deci & Ryan, 2000). As the first need of interest in SDT research, autonomy ties into the logic that extrinsic motivation lowers the individuals feeling of freedom, or doing what they are rewarded for from their own accord. The need for autonomy does not require a person to act independent of any external influence, but according to their own choice and will (Van den Broeck et al., 2016). For example, if an individual is asked to work overtime, and they willingly agree, they meet their need for autonomy. If they would rather not work, but go home or they had plans for dinner and want to follow through, the need is thwarted (Trougakos et al. 2014)

The need for competence, though less complex, also needs to be met for a person to thrive. The need for competence means to "feel a sense of mastery over the environment and to develop new skills." (Van den Broeck et al., 2016). This also ties into the human need for the optimal challenge, which is said to be one of the most salient motivators for individuals. A feeling of being immersed in their task is invoked when the challenge and the individual's skill is on par (Csikszentmihalyi, 1990).

The third need is the need for relatedness. The need to experience relatedness is to "feel personally accepted by and significant to others, and to feel cared for by others and caring of them." (Deci & Ryan, 2014). It is one of the highest values and motivators for people of all cultures to feel a meaningful connection in relationships to others (Reis 2011). Thus, SDT proposes relatedness as a psychological need that evolved on its own with humans, out of a need to stick together, share and reciprocally help each other to survive (Deci & Ryan, 2014).

Boredom and the Basic Psychological Needs Theory

Fisher (1993) in her foundational work 'Boredom at work: a neglected concept', was one of the first to steer the organizational boredom literature into a more holistic direction. She did this by not only focusing on the monotony of tasks as the main reason for job-boredom, but also shining light on other possible culprits, including task-attributes, environment, personality, and person-environment fit.

Most of the literature at the time of Fishers' (1993) work focused on *qualitative underload* and *quantitative underload.* The first refers to the monotony and simplicity of tasks. The second indicates the absence of having something to do, especially after a period of intense workload. Fisher (1993) recommended looking into another aspect of task effects, namely *qualitative overload.* Qualitative overload means that the task is too challenging or difficult for the person. This is mostly caused by lack of expertise, which then leads to boredom, because of the difficulty to keep one's attention on the task (Csikszentmihalyi, 1975; Deci & Ryan, 1985). This also ties into the concept of flow, proposed by Csikszentmihalyi (1990). Flow represents the polar opposite of boredom. It is a state of optimal experience, that can be achieved not only in leisure but also at work (Cisksentmihalyi & LeFevre, 1989). Flow can be achieved, when the environment offers up plenty of opportunities, in other words challenges, and those challenges can be mastered by the individual facing it, meaning they have a level of skill matching the challenges. This state of flow allows the individual experiencing it to feel subjectively good, and also aids in learning new skills, increasing self-esteem and discovering personal complexities (Cisksentmihalyi, 1975, 1982).

The fulfilment of the need for competence requires the individual to be stimulated by challenges, as well as being able to effectively and actively use one's skills when working on the challenge (Deci & Ryan, 2000). The need is fulfilled when the task is not too hard (qualitative overload) or too easy (qualitative underload). Not fulfilling the need can lead to task disengagement and trouble focusing on the task, causing job boredom and leading to counterproductive work behaviour (Khan et al., 2022). Not only in work settings, but also in educational settings does the experience of competence seem to alleviate boredom substantially (Sluea et al., 2015)

Hence, I propose the following Hypothesis:

Hypothesis 2a: Boredom at work negatively relates to the fulfilment of the basic psychological need for competence.

Fisher (1993) proposes that environmental factors, play a role in creating boredom. Environmental factors help to diminish, or increase boredom, when the task itself is not keeping the individual's attention for its lack of stimulation. Fisher (1993) goes into two

directions concerning environmental elements. Firstly, the individual's coworkers can affect their experience of boredom, whether they work together or just share the workplace. One way boredom can be directly reduced by coworkers is through conversation, which poses direct stimulation for the individual. Additionally, coworkers can reduce boredom in an indirect way, by merely being present in the room. While co-workers can be a means to decrease an individual's boredom, they can also increase it, when they are perceived as uninteresting, or their style of speech and gestures are perceived as boring (i.e. slow, monotonous, low affectivity). Furthermore, social support may play a role in reducing boredom (Reijseger, 2013; Parker & Ohly, 2008).

Relatedness, describes the need to feel connected to others. When the need is fulfilled, a person feels more motivated and is more productive (Grant, 2008). Additionally, relatedness satisfaction makes up for low job control (Van Yperen & Hagedoorn, 2003). When unfulfilled, the lack of relatedness satisfaction may lead to social alienation, loneliness, and exclusion (Vansteenkiste et al., 2020). The need is satisfied when developing close intimate relationship with others or feel as part of a group (Deci & Ryan, 2000, Van den Broeck et al., 2016). In a work context relatedness-satisfaction comes from social support, and building work relationships, thus reducing loneliness (Van den Broeck et al., 2010). Additionally, being stimulated by coworkers, through direct or indirect contact relatedness seems to be experienced and boredom seems to be reduced. Moreover, the satisfaction of one psychological need has been found to increase the satisfaction of the other psychological needs, thus making relatedness more likely to decrease boredom, even if it is through aiding the other needs to be fulfilled (Van den Broeck et al., 2008).

For these reasons I propose the following hypothesis:

Hypothesis 2b: Boredom at work negatively relates to the fulfilment of the basic psychological need for relatedness.

The second environmental factor causing boredom, described by Fisher (1993) is 'Organizational Control Practices and Constraints'. These are extrinsic control factors, determining which extent constraints and control practices are placed on employee behaviour. An example could be the prohibition of talking, prescribed breaks, or exact procedures on how to do the work. This can lead to reactance, which indirectly creates

boredom. Reactance means that if freedom of choice is threatened in any way, the individual wants to regain that freedom and tends to find forbidden or restricted activities more interesting, just because they are forbidden (Brehm & Brehm, 1981). Furthermore, extrinsic control plays a role in the magnitude of the perceived boredom. The more striking the extrinsic control, the lower the likelihood to find an activity interesting. This is caused by the reduction of intrinsic interest (Deci & Ryan 1985).

Autonomy, as the experience of willingness and volition to do something can thus greatly be restricted by organizational work-regulations. When the person does not experience integrity in their acting, thinking and behaviour, the need for autonomy is not fulfilled (Ryan & Deci, 2017; Vansteenkiste et al., 2020). Additionally, lacking autonomy or feeling constrained has been found to cause boredom (Fisher, 1993; Reijseger et al., 2013; Van Hooff & Van Hooft 2017, 2018).

This does not only hold true to boredom at work, but also in educational settings. For example, autonomy counteracts boredom by helping to develop a resistance against it (Patrick et al., 1993). This also holds true in university students, whose cognitive appraisal of how boring an educational situation is strongly depending on their perceived autonomy support (Tze et al., 2014). Additionally, Daschmann et al. (2011) found that enabling autonomy correlated negatively with many causes of boredom in grade-schoolers, for example the task being too challenging or lacking meaning.

Thus, I propose the following hypothesis:

Hypothesis 2c: Boredom at work negatively relates to the fulfilment of the basic psychological need for autonomy.

The above considerations show that satisfaction of the individual basic psychological needs is thought to reduce boredom at work. Global needs satisfaction thus should also reduce boredom. This is also shown in the literature (e.g. Sluea et al., 2015; Van Hooff & Van Hooft, 2016,2017).

Hence the following hypothesis is proposed:

Hypothesis 2d: Boredom at work negatively relates to the fulfilment of basic psychological needs.

Though SDT hints at a directionality of the relationship between boredom and the satisfaction of needs, there are other theories suggesting the opposite direction. The broaden-and-build theory (BBT) for example suggest, that affect, in the case of BBT positive affect, fosters psychosocial resources. These psychological resources are related to autonomy, competence and relatedness (Frederickson, 2001.). Thus, BBT suggests another possible direction of influence, from affect on the satisfaction of basic psychological needs. Tian et al. (2014) found a bidirectional relationship between the satisfaction of the need competence and affect in a school setting. When trying to clarify the directionality between need satisfaction and affect, Uanue et al. (2023) found a bidirectional association between the two constructs. Levine et al. (2021) on the other hand only found a directional effect for needs thwarting on negative emotions. Garn et al. (2019) also only found that affect was predicted by need satisfaction but not vice versa.

As shown earlier, a relationship between need satisfaction and affect, in this case boredom, has been found in previous research. Temporal precedence from either of the two constructs could not clearly be shown in past research. Since there seems to be conflicting evidence about the directionality between affect, in this study negative affect in the form of boredom at work, and the satisfaction or thwarting of the basic psychological needs autonomy, competence and relatedness, I propose the following hypotheses:

Hypothesis 3a: The fulfilment of the basic psychological needs negatively relates to the experience of boredom at work.

Hypothesis 3b: The fulfilment of the basic psychological need autonomy negatively relates to the experience of boredom at work.

Hypothesis 3c: The fulfilment of the basic psychological need competence negatively relates to the experience of boredom at work.

Hypothesis 3d: The fulfilment of the basic psychological need relatedness negatively relates to the experience of boredom at work.

Coping

Coping, according to the APA Dictionary of Psychology means "the use of cognitive and behavioural strategies to manage the demands of a situation when these are appraised as taxing or exceeding one's resources or to reduce the negative emotions and conflict caused by stress". In other words, coping helps us to manage stressful situations in which we are prone to experience negative emotions.

In its naissance, coping was split into two categories, namely problem-focused coping and emotion-focused coping (Folkman & Lazarus, 1980). Carver et al. (1989) with the introduction of the Coping Orientation to Problems Experienced Inventory (COPE), broadened or specified the ways how individuals cope with situations, since most of the coping strategies involved, at least to some extent, both problem-focused and emotion-focused coping. Therefore, they proposed the following coping strategies: *Active Coping, Planning, Suppression of competing activities, Restraint coping, Seeking social support for instrumental reasons, Seeking social support for emotional reasons, Positive reinterpretation & growth, Acceptance, Turning to religion, Focus on & venting of emotions, Denial, Behavioural disengagement, Mental disengagement.*

These can be, and in contemporary research are, broadly put into two categories (Folkman & Moskowitz, 2000;Sun et al., 2019). (1) Negative coping, for example *Denial* or *Behavioural disengagement,* where the focus is on avoiding the stressful circumstance and to not engage with it may that be cognitive or behavioural. Here the locus of control is perceived to be external. (2) Positive coping, for example *Active coping,* or *Seeking social support for emotional reasons,* where the focus is on what the individual can do. Here the locus of control is perceived to be internal (Jia et al., 2004; Martos et al., 2021). These two classifications of coping have been shown to bring about contrasting effects on affect. Negative coping increases negative affect and decreases positive affect, while positive coping increases positive affect and decreases negative affect. This has been found in clinical settings (Dunkley et al., 2017), in students (Nett et al., 2010; Daniels et al., 2015) and work settings (Whiteoak, 2014).

Both aspects of coping have also been brought into relation with needs satisfaction (Bakracheva, 2019) and boredom (Whiteoak, 2014; Game, 2007; Van Hooff & Van Hooft, 2023). It has been shown that the needs satisfaction is positively, and boredom is negatively influenced by positive coping strategies (Nett et al., 2010; Whiteoak, 2014; Bakracheva, 2019). This implies that, even when need satisfaction is low, coping can aid to reduce

boredom. Conversely, the effects of boredom on need satisfaction can be reduced by coping in a positive fashion. This happens through taking action when feeling negative emotions, like boredom. For example does a person cognitively reappraise the situation they are in, or change something about their behaviour, therefore reducing the effect boredom has on the satisfaction of needs (Dunkley et al., 2017; Nett et al., 2010; Daniels et al., 2015; Whiteoak, 2014).

Only a few studies have been conducted looking at boredom-coping in at the workplace. These yield first insights with qualitative interviews, focused on repetitive tasks of blue-collar workers (Game, 2007; Whiteoak, 2014). Boredom coping is made up of cognitive-coping strategies and behavioural-coping strategies. (Game, 2007; Nett et al., 2010; Whiteoak, 2014; Daniels et al., 2015). Cognitive-coping strategies are those, where the individual uses mental activity to manage stressful or challenging situations (American Psychological Association, n.d). Behavioural-coping strategies are those, where the individual modifies their actions in order to handle stressful or challenging situations (American Psychological Association, n.d). Though actively coping with a cognitive-approach has been found to effectively reduce boredom (Nett et al., 2010; Daniels et al., 2015), this has, so far, only been investigated in school and university settings. In educational environments behavioural-coping is more restricted than cognitive-coping. Therefore, looking at white-collar jobs with more flexibility in controlling their environment, this study focuses on the behavioural side of active coping.

Hence, the following Hypothesis is proposed:

Hypothesis 4a: Active Coping has a moderating effect on the relationship between boredom and the satisfaction of needs.

Hypothesis 4b: Active Coping has a moderating effect on the relationship between need satisfaction and boredom.

Methods

In order to test the hypothesis, an online daily diary study was conducted. In total, the participants were asked to fill out a short battery containing 10 different scales, mostly in abbreviated formats, on ten consecutive workdays. This method was chosen in order to answer the question of directionality between the two main concepts boredom and needs satisfaction. Directionality or rather causality, cannot be determined without longitudinal

data. Moreover, using online surveys is the most economical approach to gathering data, for the researchers as well as for the participants, since online surveys are easily distributed, filled out speedily, and also brings close to no financial expenses with it. The participants were asked to fill out the battery every day after work, and received a reminder, per email, at 5 pm. They could then choose to fill out the form or not, but in order to incentivise filling out the questionnaires, I gave away 5 vouchers of 100 euros for a convenience store of their choice, among those who filled out the survey on all of the 10 days. Additionally, I donated two euros to the "Österreischische Volkshilfe" for each participant.

Ohly et al. (2010) made recommendations on the number of participants and the number of days, for predictors focusing at the person level and predictors focusing at the day-to-day level, respectively. These were at least 100 persons and at least 5 days per person. The participants in this online survey had to work at least 20 hours a day, I expanded the 5-day recommendation to 10 days, to account for participants working only 2 to 3 days per week.

Sample

The convenience sample has been gathered through the use of social media such as Instagram, as well as the networking platform LinkedIn. Additionally, personal acquaintances of the researcher have been contacted and asked to fill out the online survey.

Table 1 Sociodemographic Characteristics of Participants at Baseline

	n	%
Gender		
Female	67	46.2
Male	78	53.8
Highest educational level		
Apprentice/College	9	6.2
High school	20	13.8
University or postgraduate degree	116	80
Employment-Group		
Leadership	38	26.2
Academic	72	49.7
Technician	11	7.6
Office worker	20	13.8
Craftsman	2	1.4
Elementary Occupations	1	0.7
Sales	1	0.7

Note N = 145. Participants were on average 35.21 years old (SD = 11.98; min = 20; max = 68).

The participants were informed about the need for and importance of the research topic. They were assured, that confidentiality as well as their anonymity were being protected, as per DSGVO (General Data Protection Regulation). 145 persons filled out the 'basic'-questionnaire, containing work-related questions (e.g. How many hours do you work per week) as well as sociodemographic questions (e.g. age, sex and education). The daily diary-survey contained 10 different scales all dealing with different constructs. In the study at hand, only 3 of the 10 scales were used.

The surveys success rate (65.5%) was acceptable with an initial 145 participants and after excluding participants who did not work at least 20 hours or more per week and those who did not fill out at least two consecutive workdays, I was left with 95 participants.

The sociodemographic data of the sample can be found in Table 1.

Measures

To answer the research question in the study at hand, three of the 10 scales of the online survey were used. The measures were used in English as well as in German, depending on the participant's preference. The measures that were originally designed in English were translated by using blinded back-and-forth translation, where one of the researchers using this sample translated the questions into German, and another researcher translated them back to English. Then they were compared again and adjusted.

WBN-S scale

The Work-related Basic Need Satisfaction scale (WBN-S scale; Van den Broeck et al. 2010) measures the satisfaction of basic psychological needs according to SDT. The original scale contained six items per need. To minimize the overall length of the diary questionnaires, I decided to include only four of the six items per need. The three needs are "Autonomy", "Competence" and "Relatedness", leaving us with twelve items in total. The WBN-S scale utilizes a seven-point Likert scale (1 = *not at all* to 7 = totally). An example of a question would be: "Today I felt competent at my job". The WBN-S scale did reach at least acceptable internal consistency on the global level and in all but the subscale of relatedness, in which the internal consistency was questionable (Table 2). Additionally, the WBN-S scale showed a high construct validity and a particularly pronounced nomological validity (Colledani et al. 2018).

DUBS

The Dutch Boredom Scale (DUBS), created by Reijseger et al. (2013), measures boredom experienced during the workday. Initially containing eight Items loading on two factors, Reijseger et al. (2013) removed the two items loading on the second factor. After a second Principal Component Analysis (PCA), the remaining six items returned a single-factor solution that explained 51% of the variance. The internal consistency (Table 2) of the sample at hand showed similar internal consistency (Cornbach's α) as the sample in Reijseger et al. (2013) sample.

The items of the DUBS were adapted to fit the narrative of a diary study, meaning that they ask about a specific workday. The pretext for each question was 'To what extent do the following statements apply to today's working day? Today…' which was then followed by the adapted questions. For example, 'At work, time goes by very slowly' was changed to '…at work time *went* by very slowly'. A seven-point Likert-scale (0 = *not at all* to 6 = *extremely*) was used. The DUBS had good internal consistency (Table 2).

Brief-COPE

The Brief Coping Orientation to Problems Experienced Inventory (Brief-COPE; Carver, 1997) measures the different ways in which a person copes with challenges involving stress, they are faced with. With its 28 items, it is a shorter form of the Coping Orientation to Problems Experienced Inventory (COPE; Carver et al. 1989), hence "Brief"-COPE, which also measures the coping responses of people to stress.

The items of the Brief-COPE were adapted to the diary study format. Additionally, I was only interested in active coping. Carvers' (1997) factor analysis of the Brief-COPE yielded multiple factors, one of which included the subscales "Active Coping", "Planning", and "Positive Reframing". Being left with these three subscales I also excluded "Positive Reframing" because of its sole cognitive focus, compared to the behavioral focus of the other two subscales. I was left with four items, two concerning the "Active Coping" sub-scale and two concerning the "Planning" sub-scale. The Brief-COPE uses a four-point Likert-scale (0 = *I haven't been doing this at all* to 3 = *I've been doing this a lot).* The pretext for each question was '*Today…*' followed by the actual questions, that were adapted to the diary format. For example: '*...I've been concentrating my efforts on doing something about the*

situation I'm in.' (Active Coping) or *'...I've been trying to come up with a strategy about what to do.'*. The Brief-COPE had excellent internal consistency in the sample at hand (Table 2).

Table 2 Reliability of Scales used

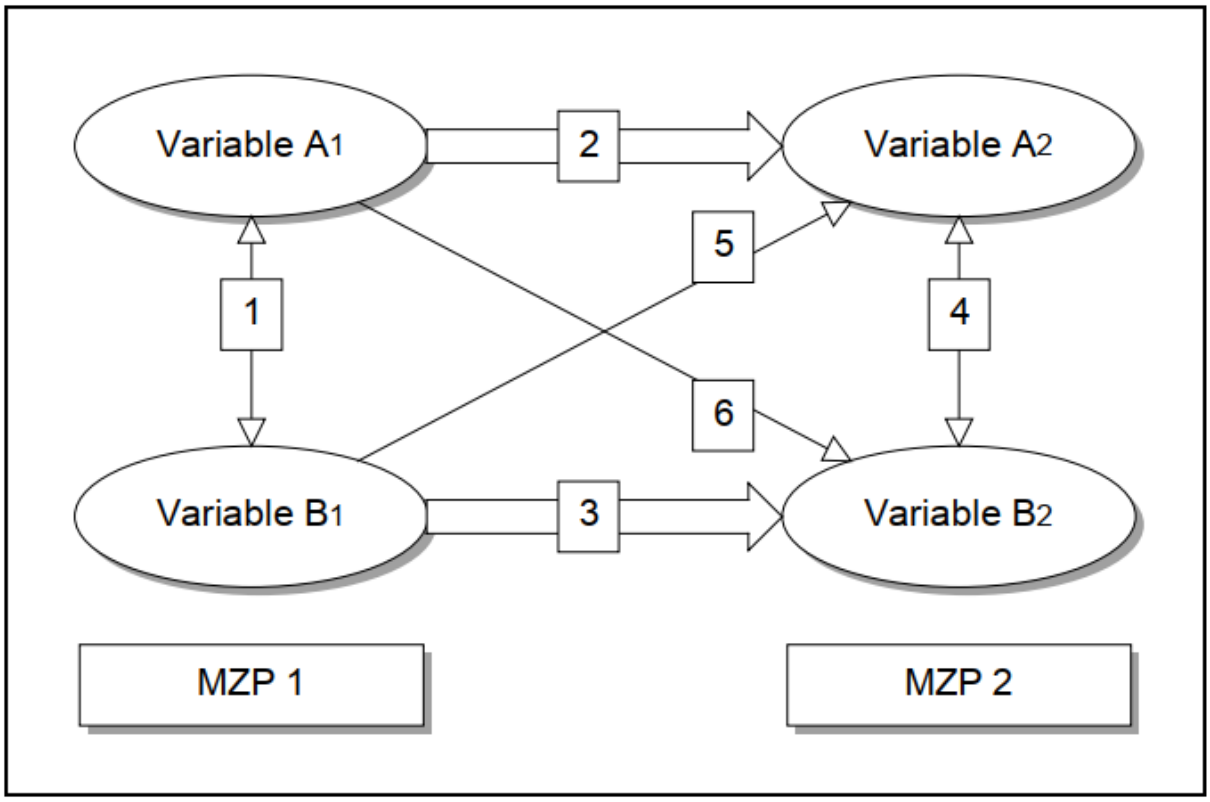
	DUBS	WBNS	WBN-S_aut	WBN-S_com	WBN-S_rel	BRIEF-COPE
α	.89	.85	.77	.93	.66	.91
ω	.94	.90	.82	.94	.77	.95

Note WBN-S_aut = Subscale 'Autonomy' of the WBN-S scale; WBN-S_com = Subscale 'Competence' of the WBN-S scale; WBN-S_rel = Subscale 'Relateness' of the WBN-S scale; α = Cronbach's Alpha; ω = Omega total (McNeish 2018)

Statistical Analysis

The model used to analyze the data and determine the directionality of the correlation between boredom and needs satisfaction in the organizational context was a Cross-Lagged-Panel-Model (CLPM; Figure1). The CLPM is widely used for examining causality using longitudinal data (Duncan, 1969; Finkel, 1995; Reinders 2006).

Figure 1. Conceptional Model of a two-wave Cross-Lagged-Panel-Model. (Reinders, 2006)



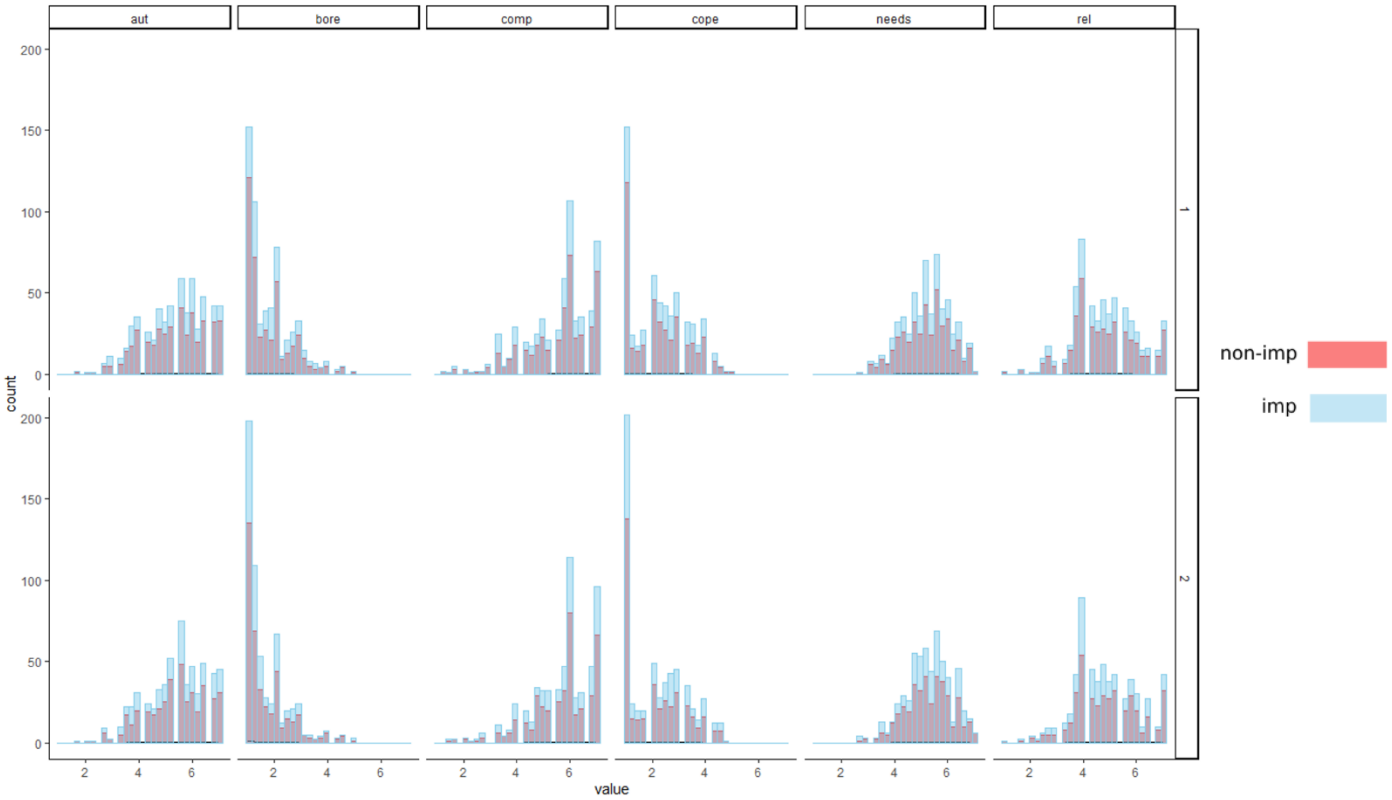
Note MZP = Time of Measurement

The CLPM examines both directions of the variables, making both of them dependent and independent variables at the same time, hence “Cross”. It also utilizes multiple points in time, hence “Lagged”. “Panel” refers to the panel of participants surveyed with the CLPM.

The CLPM allowed us to test the hypotheses regarding the relationship between boredom and needs satisfaction as a whole (H2d, H3a), the relationship between boredom and the three basic psychological needs autonomy (H2c, H3b), competence (H2a, H3c) and relatedness (H2b, H3d), as well as the autocorrelation of boredom (H1).

There are various critiques regarding the CLPM and its shortcomings (Hamaker, 2015; Lucas, 2023). Those recommend using alternatives, for example, the Random-Intercept Cross Lagged Panel Model (RI-CLPM). The RI-CLPM uses random intercepts to acknowledge that every person might start at different baseline levels of the variables that are looked at. The RI-CLPM allows to account for individual differences by not fixating the starting point for every participant to the same value. Thus, an explorative analysis using the RI-CLPM with three waves has been conducted, in order to acknowledge the limitations of the model used. Since the CLPM in this study looked at two measurement points only, I was able to reuse the participants data in the following way: Measurement points that exceeded the first and second measurement were recoded to fit into the model, meaning the same person was included multiple times. This was achieved by reusing measurements, with measurement 1 and 2, 2 and 3, 3 and 4, up until their respective last measurement. This increased the dataset from 95 measurements to 590. Additionally, the missing data was imputed using the Multivariate Imputation by Chained Equations (MICE) algorithm with the classification and regression trees (CART) method, in R. I decided to impute the data using CART, even though Multiple Bayesian Regression Imputation might have yielded slightly better results (Chhabra et al 2017). That is because CART offers easy usability by needing close to no tuning by the imputee, as well as because of the robustness of CART concerning outliers, skewed distributions and the ability to deal with collinearity (Burgette & Reiter 2010; Breiman et al. 1984). Figure 2 shows the comparison between the distributions of the data with and without imputed data. Moreover, was the data standardized, in order to ensure comparability of scales.

Figure 2. Comparison of Distributions of imputed and non-imputed data.



Note. aut = 'Autonomy'; bore = 'Boredom'; comp = 'Competence'; cope = 'Coping'; needs = 'Need satisfaction'; rel = 'Relatedness'; non-imp = Data that has not been imputed; imp = Data that has been imputed; 1 = First Measurement; 2 = Second Measurement.

Results

Descriptive Statistics

Descriptive Statistics are outlined in Table 3. An additional correlation table looking at the within-subject differences is found in Appendix B. Reliabilities are found, as aforementioned in Table 2.

Hypothesis Testing

The hypotheses, as they were outlined in the introductory part of this paper, were tested with the statistical analysis methods outlined in the 'statistical analysis' part of the methods section.

It was hypothesized, that experiencing boredom at work on the previous day relates to experiencing boredom at work the following day (H1). This autocorrelative 'carry-over' effect was not shown, since there were no significant results in any of the models including an autocorrelative path for boredom (Table 3). Thus, hypothesis H1 was not confirmed.

Table 3. Correlations with descriptive variables

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
(1) AGE									
(2) SEX	0.14**								
(3) EDU	0.03	-0.02							
(4) BORE	-0.02	0.03	0.07						
(5) NEEDS	-0.05	-0.08*	-0.05	-0.49***					
(6) AUT	-0.09	-0.11	-0.04	-0.22***	0.72***				
(7) COMP	-0.03	-0.03	-0.04	-0.46***	0.79***	0.38***			
(8) REL	0	-0.04	-0.03***	-0.40***	0.74***	0.26***	0.39***		
(9) COPE	0.02	-0.01	-0.01***	0.19***	-0.17***	-0.19***	-0.10*	-0.11*	

$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$

Note. Within-Person Correlations are found in Appendix B. Lower-Triangle: Between-Person

Hypothesis 2a, 2b, 2c and 2d, assumed that boredom at work has a negative influence on the psychological needs (H2d), autonomy (H2c), competence (H2a and relatedness (H2b) on the next day. These hypotheses were examined by using a cross-lagged-panel-design. Results showed no significant effect between boredom and need satisfaction (β = .03, [95% CI: -0.03, 0.08], *p* = .37), boredom and autonomy satisfaction (β = .00, [95% CI: -0.06, 0.06], *p* = .99) and boredom and relatedness satisfaction (β = -.03, [95% CI: -0.09, 0.03], *p* = .27). Therefore, hypotheses 2b, 2c and 2d were not supported. There was a discernable effect of boredom on competence satisfaction (β = .09, [95% CI: 0.03, 0.14], *p* = .002). Contrary to expectation, hypothesis 2a was not upheld, since it assumed a negative relation between the two constructs, but a positive relationship was found. In cross-lagged designs, effect sizes are typically measured by the standardized regression coefficient (Orth et al. 2022). Even though the effect seems small (β = .09) looking at Orth et als'. (2022) guidelines for cross-lagged effects, we can see that the effect found here can be classified as a medium sized effect.

Hypothesis 3a, 3b, 3c and 3d, predicted that the satisfaction of needs (H3a), autonomy (H3b), competence (H3c) and relatedness (H3d) had a negative influence on boredom on the next day, meaning a decrease in boredom on the next day. A cross-lagged-panel design was used to analyze the data. No significant effects were found for the effect of needs satisfaction on boredom (β = .03, [95% CI: -0.03, 0.08], *p* = .37), autonomy satisfaction on boredom (β = .00, [95% CI: -0.06, 0.06], *p* = .99) and relatedness satisfaction on boredom

(β = -.03, [95% CI: -0.09, 0.03], *p* = .27). Thus, hypotheses 3a, 3b and 3d were rejected. A significant relationship between competence satisfaction and boredom (β = .09, [95% CI: 0.03, 0.14], *p* = .002) has been found. Nevertheless, because the direction of the effect contradicts the hypothesized effect, hypothesis 3c was refuted by the results.

Hypotheses 2a-d and 3a-d were fitted to a CLPM and then their fit was compared to a model with equality restriction, which assumes, that both cross-lagged paths had the same coefficient. This is done for parsimony's sake and requires a Chi-Square (χ^2) test to compare the model fit of the unconstrained and the constrained model. Since we are working with a low degrees of freedom model (df = 1) and the sample isn't large, no model fit indices are reported, as they would be of no value (Kenny et al., 2014). Comparative model fit indices as well as the results of the χ^2-test comparison can be found in Table 4.

Table 4. Comparative Model Fit Indices and χ^2 test *for hypotheses 2a through 2d and hypotheses 3a through 3d. Comparison between CLPM without equality restriction and with equality restriction.*

	Model Fit				Model Fit 2				χ^2-diff	RMSEA	p
	df	AIC	*BIC*	χ^2	*df*	AIC	*BIC*	χ^2			
Needs	0	3198	3229	0.00	1	3197	3223	0.81	0.81	.00	.37
Autonomy	0	3318	3349	0.00	1	3318	3344	1.44	1.44	.03	.23
Relatedness	0	3270	3300	0.00	1	3268	3294	0.09	0.09	.00	.75
Competence	0	3165	3196	0.00	1	3163	3190	0.11	0.11	.00	.74

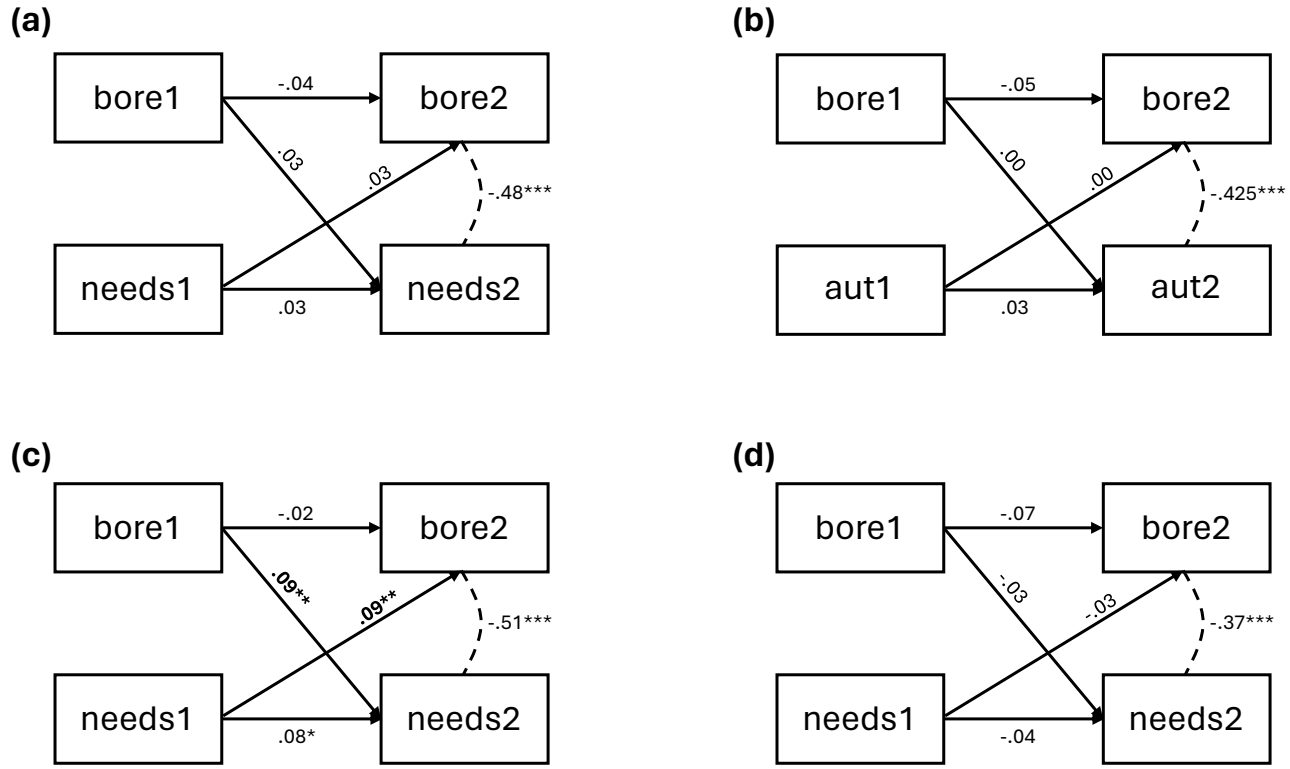
Note. Model fit = CLPM without equality restriction; Model Fit 2 = CLPM with equality restriction. AIC = Akalke information Criterion; BIC = Bayesian Information Criterion. Both criteria serve as goodness of fit estimates when comparing two models using the same data. RMSEA = Root mean square error of approximation.

Hypothesis 4a and 4b predicted that active coping moderates the relationship between need satisfaction and boredom (H4a) and the effect of boredom on need satisfaction on the next day (H4b). The evidence presented no significant effect of the regressions representing the effect of boredom on need satisfaction (β = -.01, [95% CI: -0.14, 0.13], *p* = .93) and need satisfaction on boredom (β = -.01, [95% CI: -0.14, 0.13], *p* = .93). The effects weren't moderated by the Interaction between active coping and boredom (β = .08, [95% CI: -0.20, 0.13], *p* = .49) and active coping and need satisfaction (β = .05, [95% CI: -0.36, 0.46], *p* = .81). Therefore, evidence to support hypotheses 4a and 4b was insufficient. As with hypotheses 2 and 3 the moderation-cross-lagged model fit was compared to a model with equality restriction, which yielded that the two model fits did not differ significantly (*p* =

0.55) and therefore the equality restricted model was chosen for parsimonies sake. In an exploratory analysis the individual needs have also been tested for moderation effects with active coping but yielded no significant results.

In order to ease the interpretation of the findings, the models of hypotheses H1, H2 and H3 are shown below (Figure 3). The model analysis of all hypotheses (H1, H2a – H2d, H3a – H3d, H4) are shown in Table 5. Additionally, the statistical model of hypothesis H4 is shown in Figure 4 and the model analysis is shown in Table 5.

Figure 3 CLPM of Global (a) and individual Needs (b, autonomy; c, competence; d, relatedness)



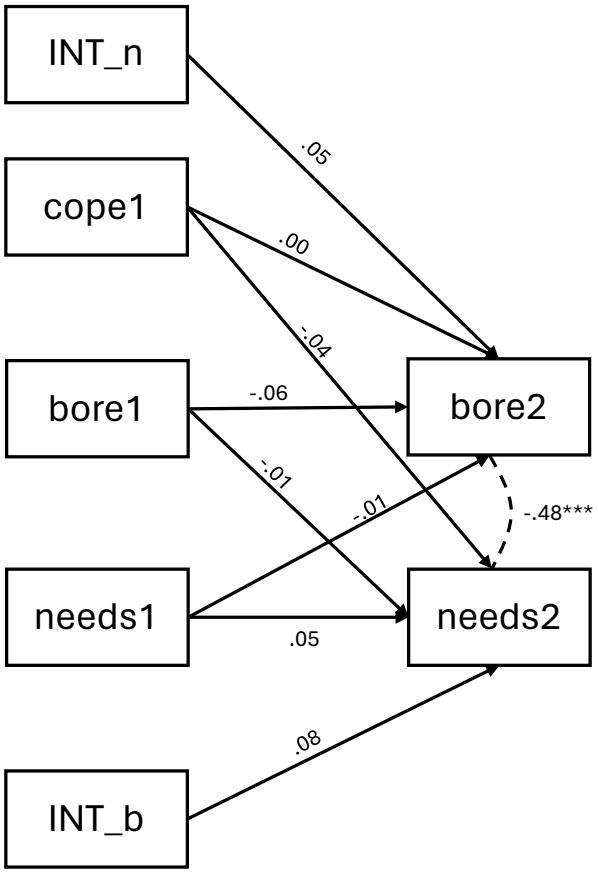
Note. bore = boredom; needs = satisfaction of psychological needs; aut = autonomy; rel = relatedness; comp = competence. '1' = first measurement of the variable; '2' = second measurement of variable.

Table 5 standardized estimates of structural parameters of the cross lagged models.

Predictive Paths	Parameters		
	Estimate (β)	p	[95% CI]
Needs → Bore	0.03	0.37	[-0.03; 0.08]
Bore → Needs	0.03	0.37	[-0.03; 0.08]
Bore → Bore	-0.04	0.30	[-0.11; 0.04]
Aut → Bore	-0.00	0.99	[-0.06; 0.06]
Bore → Aut	-0.00	0.99	[-0.06; 0.06]
Bore → Bore	-0.05	0.19	[-0.11; 0.04]
Comp → Bore	0.09	0.00	[0.03; 0.14]
Bore → Comp	0.09	0.00	[0.03; 0.14]
Bore → Bore	-0.02	0.54	[-0.09; 0.05]
Rel → Bore	-0.03	0.27	[-0.09; 0.03]
Bore → Rel	-0.03	0.27	[-0.09; 0.03]
Bore → Bore	-0.07	0.08	[-0.14; 0.01]
Moderation Analysis:			
Needs → Bore	-0.01	0.93	[-0.14; 0.13]
Cope → Bore	0.00	0.99	[-0.41; 0.42]
Int → Bore	0.05	0.81	[-0.36; 0.46]
Bore → Needs	-0.01	0.93	[-0.14; 0.13]
Cope → Needs	-0.04	0.66	[-0.14; 0.30]
Int → Needs	0.08	0.49	[-0.20; 0.13]

Note. Needs = Global needs satisfaction; Aut = autonomy; Rel = relatedness; Comp = competence; Bore = Boredom

Figure 4. CLPM with Active Coping as Moderator



Note. bore = boredom; needs = satisfaction of psychological needs; cope = active coping. '1' = first measurement of the variable; '2' = second measurement of variable; INT_n = interaction of active coping and need satisfaction; INT_b = interaction of active coping and boredom.

Discussion

The primary aim of this study was to extend the already existing literature on daily job boredom and its relationship to the daily basic psychological need satisfaction according to SDT, especially in order to clarify the directionality of influence between the two constructs. For that purpose, it was postulated that both constructs influence each other in a bidirectional way. Additionally, active coping was postulated as a moderator of that relationship. Furthermore, the autocorrelative relationship of boredom at work has been examined.

Boredom with its many negative side effects, including ill-being (Pekrun et al., 2010), depressive symptoms (Game, 2007; Vodanovich, 2000; Van Hooff & Van Hooft, 2014, 2016) and absenteeism (Reijseger et al., 2013, Van Hooff & Van Hooft, 2018) among others, is a construct worth examining. I defined boredom as 'a profound negative (i.e. unpleasant, dissatisfying) and deactivating (low-arousal) activity-related emotion, implying that

employees' work activities have negative intrinsic value' (Fisher, 1993; Perkun et al., 2010; Van Hooft & Van Hooff, 2014).

Boredom seems to have a way of affecting itself with feelings that spill over and carry on as observed by Van Hooff and Van Hooft (2017), Barnes et al. (2021), and Wang et al. (2024). This pattern indicates that as boredom escalates from one day to another, it sets off a cycle that can impact employees' well-being. This led to our first hypothesis (H1), proposing that the experience of boredom at work positively relates to the experience of boredom at work the next day. The hypothesis could not be confirmed by the data in this study. One of the reasons could be that, since boredom is an emotion that can come and go, it might have a more episodic nature than expected. Additionally, even though emotions tend to spill over into other areas of life, there could be mediators that help the spill-over to dissipate after work, as shown by Van Hooff & Van Hooft (2016). This suggests that further research needs to be conducted to clarify the role that other factors, like leisure need satisfaction, or work motivation, may play in the autocorrelative relationship of job boredom.

Self-determination theory (SDT), is a theory of motivation that has been brought in relationship with boredom, especially through one of its mini theories, the basic psychological need theory (BPNT). BPNT looks at autonomy, competence and relatedness as the three basic human psychological needs (Ryan & Deci, 2000). According to existing literature, boredom seems to hamper the fulfilment of autonomy (Fisher, 1993; Patrick et al., 1993; Daschmann et al., 2011; Reijseger et al., 2013; Tze et al., 2014; Van Hooff & Van Hooft 2017, 2018), competence (Csikszentmihalyi, 1990; Fisher, 1993; Sluea et al., 2015; Khan et al., 2022) and relatedness (Fisher, 1993; Parker & Ohly, 2008; Van den Broeck et al., 2008; Reijseger et al., 2013). I, thus, hypothesized that boredom at work negatively influences the satisfaction of basic psychological needs (H2d) autonomy (H2c), competence (H2a) and relatedness(H2b). The data yielded no evidence supporting these hypotheses. One of the reasons for these results could be, that, though occupation has been found to be near-irrelevant when it comes to experiencing job boredom (Van der Heijden et al., 2012), there may be a higher discrepancy between the experience of boredom when looking at differences in vocation and education. The study's sample consists of mostly white collar jobs (97.2%) which might be less boring, since they tend not to be mundane and offer task-diversity and challenging tasks. Moreover, the majority of the sample had higher education,

with 80% having an university degree, hints at a higher level of skill, which, when combined with more challenging jobs could be an antagonist to job boredom. Another reason could be found when looking at the ceiling and floor effects of boredom and needs satisfaction. The ceiling effect is a phenomenon where the majority of a measured variable is at the upper end of the measurement scale. (American Psychological Association, n.d) For example, if a test is too easy for the participants taking the test, most of them will have very high scores, which leads to a skewed distribution and low variance of the results. Conversely, the floor effect occurs when the majority of the measured variables are on the lower end of the measurement scale, also resulting in the skewedness of the distribution and a low variance in results. American Psychological Association, n.d) The example could be a test that is too hard for the participants. In our sample there seem to be ceiling and floor effects, for boredom and coping, and for the basic psychological needs, respectively. This can be seen in the distributions of Figure 2 and in the boxplots that can be found in Appendix B. Because the boredom in the sample of this study is very low and the need satisfaction is very high, no negative effect of high boredom on need satisfaction can be found, even if there was one.

In contrast to expectations, the observed relationship between boredom and competence satisfaction was positive. This means, that experiencing boredom one day, increases the feeling of competence the next day. This could be attributed to a possible variability of work and following that, the variability of actually experiencing boredom or competence at work on one day, but not on the following day. If, for example, an individual finishes a project on one day and through that feels a sense of accomplishment and competence, but then on the following day there is a downtime caused by the finishing of said project, causing the person to be bored and feeling the boredom as more pronounced as they would if they hadn't felt competent the day before. This would also be in accord with Fisher (1997) who theorized, that having little to do, after a time of having a lot to do, would increase the feeling of boredom at work, caused by *quantitative underload.* Another explanation could be, that another variable not considered in this study might influence or mediate relationship between boredom and competence. A possible example would be self-efficacy, which has been brought into relationship with boredom (Liu & Lu, 2016; Jaradat, 2018). If the sample were to be high in self-efficacy, they might view boredom as a challenge that could foster growth when overcome, thus letting them experience competence.

Even though most of the literature talks of the relationship between boredom and need satisfaction, as described above, no conclusive evidence exists of the directionality of their relationship. Existing literature hints at a direction, namely need satisfaction influencing affect (Tian et al., 2014; Garn et al., 2019; Levine et al., 2021; Uanue et al., 2023), but some evidence suggests a bidirectional influence (Tian et al., 2014; Uanue et al., 2023). Therefore hypotheses H3a – H3b were proposed, which theorized that the satisfaction of the basic psychological needs (H3a) autonomy (H3b), competence (H3c) and relatedness (H3d) negatively influence the experience of boredom on the next day. Again, no significant negative relationship between the two constructs was found, thus, the hypotheses were not supported. These results can also be the result of the sample composition, and the ceiling and floor effects as discussed above.

The relationship between competence and boredom, again was found to be positive. A reason for that could be, as explained with the relationship of the opposite direction, through fluctuations in experiencing competence from one day to another. For example, if a new project is assigned to an employee, they might be excited and stimulated by the project, experiencing competence when first working on it. As time goes by, the project may loose its novelty and earlier valence and may thus lead to an increased feeling of boredom, although competence was experienced beforehand.

Coping, especially active coping has been found to decrease negative emotions and especially boredom in educational and work settings (Game, 2007; Nett et al., 2010; Whiteoak, 2014; Daniels et al., 2015; Dunkley et al., 2017; Van Hooff & Van Hooft, 2023). Since behavioural-coping is restricted in educational settings, where most of the studies have been conducted, definitive evidence has only been yielded for cognitive-coping (Nett et al., 2010; Daniels et al., 2015). Thus behavioural-coping in work settings presents itself as a promising avenue for research. This led me to proposing that active coping has a moderating effect on the relationship between boredom and need satisfaction (H4a) and on the relationship between need satisfaction and boredom (H4b). The data returned no confirming evidence. Again, a reason for these results could be the low amount of experienced boredom and the high amount of experienced need satisfaction in the sample. This may have led to close to no coping strategies used, as seen in the distribution in Figure 2 and the boxplot in Appendix B. Also high need satisfaction and low boredom leave no room for coping, since there is nothing to cope with when it comes to the relationship.

Strengths, limitations and future research

One of the limitations of the study is the homogenous composition of the sample. Though it does not consist mostly of university students, which is a common theme in psychological research, the sample is almost uniform regarding vocation (97.2% white collar jobs) and educational level (80% with a university degree). While the sample does not allow for generalizability across different populations, it does very well in describing the population it is composed of, increasing the specificity and applicability to one group of people of the results. Still, further research should try to gather a broader sample, in order to make the findings general applicability, or show differences in socioeconomic and educational classes.

Another limitation are the ceiling and floor effects, that have been mentioned earlier. These constrain the results since the distribution of the examined variables are skewed. In particular, boredom and coping are skewed to the lower values and need satisfaction toward higher values. This indicates a restricted response range as well as a possibly limited robustness of the analyses. Nevertheless, skewed distributions are not uncommon in psychological research, especially when looking at data that represents subjective experiences. Thus, the results should not be viewed as invalidated, but their interpretation should be conducted with caution. Future research can address this by collecting a more diverse sample, possibly broadening the response-rate for the measures. Moreover, the incorporated measures should be reassessed.

This leads us to another limitation of the study. Since brief versions of each of the measures have been used there may have been a loss in validity, leading to the assumption that the complexity of the measured constructs may have not been captured in their totality. The reason for the usage of shorter forms of the measures was to increase the response rate and reasonableness for the participants. This is a common practice in psychological research. Regrading future research, a cross-validation of long and short forms of the measures could be conducted, to establish their validity. Moreover, if these yield insufficient results, new short-form measures for boredom, coping and need satisfaction can be created. This would also ease the conduction of longitudinal studies, equipping researchers with fitting tools.

Additionally, the study is limited by only looking at the satisfaction of basic psychological needs, which does not account for need thwarting. Need thwarting is

associated with negative outcomes, like ill-being, low performance and disengagement (Howard et al., 2024). Thus, the understanding of how autonomy, competence and relatedness interact with boredom is incomplete. While acknowledging the need for research that encompasses need thwarting, I decided against it, following practical reasons. First, additionally examining need thwarting would have went beyond the scope of the present study. Only focusing on need satisfaction set a clear and understandable structure for the study. Secondly there is no work-specific scale for need thwarting, meaning a new measure would have had to be created, which would require psychometric evaluation, also going beyond the scope of the study. Future research should add to the literature of the dynamic interaction between basic psychological needs and boredom by also looking at the role need thwarting plays. This would give us a more comprehensive understanding of the relationship.

A strength of the study is the diary format, in which the study has been conducted. This allowed for a longitudinal-mimicking approach of evaluating the data, enabling us to look at small day-to-day effects that might drown in formats where the measurement times are further apart. The daily diary format also increased the ecological validity of the study as well as it reduced retrospective bias through the immediacy of the questions after a workday. Implications of this strength is, that the nuanced understanding it brings of short time fluctuations in need satisfaction and boredom. Moreover, does it set a precedence for further studies in the field, investigating these, or similar constructs.

Though some may not consider it a strength, I still propose it as one, since there has been a problem in psychological research for decades. This study reports all results, even though all but two of them are not significant and the two that are, are contrary to what the researcher thought he would find. With that, this study also tries to take part in alleviating the problem called publication bias or file-drawer effect, where non-significant results or results that aren't surprising or 'interesting' are not published (Rosenthal, 1979; Francis, 2012). By still reporting and publishing the results, this study, among many others, aids the practice of transparent research. Again, it poses an example for other researchers, also reminding the reader, that the problem still hasn't resolved, and needs to be addressed over and over again.

These statistical models used in this study pose another strength. The utilization of advanced cross-lagged modelling allowed us to examine the directionality of the influence of

the variables in question. Additionally, since there has been a lot of critique of the CLPM (e.g. Hamaker, 2015; Lucas, 2023), especially when it comes to clearly differentiating between-person effects and within-person effects, the RI-CLPM has been used. It was applied in an explorative analysis to account for those critiques, by taking a closer look at the within-person differences. Despite it not yielding results, it still poses a significant strength, underlining the methodological rigor of the study. By addressing the critique of the CLPM by using the RI-CLPM the study elevates the robustness of the findings as well as its credibility.

Practical Implications

Although the data yielded only a few significant results, there are still practical implications that can be drawn from the findings.

The results showed, that competence and boredom have a positive bidirectional relationship. This can be harnessed by organisations. A way to use this relationship is to teach the employees in the company to recognize boredom and use it as a motivational cue. When realizing that they are bored employees can seek challenges or new opportunities to learn or enhance relevant skills, making use of boredom to increase their experience of competence even more.

Though data showed no indication of coping affecting the relationship between need satisfaction and boredom, coping is still a toll that can be learned and used. Organizations could train their employees to use positive, instead of negative coping strategies, since they lead to more positive outcomes, e.g. well-being. Especially learning to cope with fluctuation in affective states, such as boredom, could help employees develop resilience. This could help them to navigate boredom periods, or other negative affective states that occur when working.

Though no results were found for either direction of the relationship between boredom and relatedness, organizations could encourage employees to foster their work relationship. This could be highlighted by talking about the positively mitigating effect of collaboration and social support on boredom. By encouraging employees to work in teams, and foster meaningful relationships, e.g. by providing opportunities for social interaction, the employee well-being, productivity and motivation could be increased.

As boredom doesn't seem to autocorrelated, organizations could look for ways to make the work environment and the tasks of their employees enticing for the individual. This

could be done by looking at each employees needs on a daily basis, as well as knowing their competences and delegating work accordingly.

Conclusion

Work is a big part of most of our lives. During our working hours, as well as during leisure time, we have needs that need to be met. At work as well as in any other area, these needs can be physiological (e.g. sleep, sex and hunger) or psychological, for example our need for autonomy, competence and relatedness. When they are met, our chances of flourishing, development, and well-being increase. Boredom is an emotion that affects how we feel, how much we trust in our self-efficacy and how much we enjoy life. These two constructs have been shown to be related to each other. As shown by the results of this study, this doesn't hold true in every population. Even though boredom and need satisfaction did not display any significant negative relationship in this study, the results are not to be disregarded. A new possible positive relationship between boredom and competence has been examined in the data. This hints at another possible mechanism of boredom, and supports the notion that boredom, classified as a negative affective state, might have positive outcomes. Additionally, the significance of results, confirming what we already believe, or showing us exciting effects, we didn't think of, is only a part of scientific research. Null-results, as found in this study, also pose an aid when it comes to acquiring knowledge. In this case, they hint at a sample that is not broad enough and the importance of validated measures. They also point out, that other statistical analysis could have been conducted, even when they wouldn't have shown any other results.

Since boredom is something we all experience from time to time, and all of us have needs. If those needs are not met, we are faced by negative outcomes. Thus, further investigation into the overlooked research field of job boredom and its possible relationship with need satisfaction or need thwarting, is still needed. More specifically, looking at different cultures, broader samples, possible positive associations and using more sophisticated methods would help understanding the nuances and complexity of these two constructs, helping us to prevent and use boredom, and possibly increasing need satisfaction.

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Appendix A (as predicted)

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1) Have any data been collected for this study already?

It's complicated. We have already collected some data but explain in Question 8 why readers may consider this a valid pre-registration nevertheless.

2) What's the main question being asked or hypothesis being tested in this study?

Hypothesis 1: Does boredom at the workplace have a negative influence on the fulfillment of a) the basic psychological needs b) autonomy, c) competence and d) relatedness on the following day?

Hypothesis 2: Does the non-fulfillment of a) the basic psychological needs b) autonomy, c) competence and d) relatedness have a negative influence onboredom on the next day?

Hypothesis 3: Feeling bored during a workday increases the feeling of boredom on the next workday.

Hypothesis 4: Coping, as a moderator, has a positive influence on the correlation between boredom at work and the fulfillment of the basic psychological needs.

Since both directions of influence are possible, this study aims to find out which of the directions has a greater probability of being the correct one by using a cross lagged panel model.

3) Describe the key dependent variable(s) specifying how they will be measured.

Boredom on individual workdays measured by a short version of the Dutch Boredom Scale (DUBS).

Fulfillment of basic psychological needs on individual workdays measured by a short version of the Work-related Basic Need Satisfaction scale.

Active coping on individual workdays measured by a short version of the Brief-COPE. Active coping will function as a moderator.

All of those will be measured with daily short questionnaires at the end of the respective workday.

4) How many and which conditions will participants be assigned to?

All participants will be assigned to one condition in which they will be asked to complete the DUBS, the Brief-COPE and the Work-related Basic Need

Satisfaction scale at the end of their workday on ten consecutive workdays.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.

The design used is a cross lagged panel design. That means, that there will be multiple measuring times. Each one of these measuring points will be analysed using simple linear regressions. The cross lagged panel design should help to assume a causal realationship, when for example the correlation between the fulfillment of the basic psychological needs and boredom is stronger than the correlation between boredom and the fulfillment of the basic psychological needs.

There will also be moderator analasys in oder to determine if active coping moderates the realationship between boredom and the fulfillment of basic psychological needs or the realationship between the fulfillment of basic psychological needs and boredom.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.

Participants that do not work at least 20 hours will be excluded. Participants will also be excluded if they don't have answered on at least 2 consecutive days of the 10 workdays.

7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.

The target are at least N=100 subjects that fill out the questionnaire on at least 2 consecutive days of the 10 workdays. These number were chosen because of practical implication presented by Ohly et al. (2010).

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)

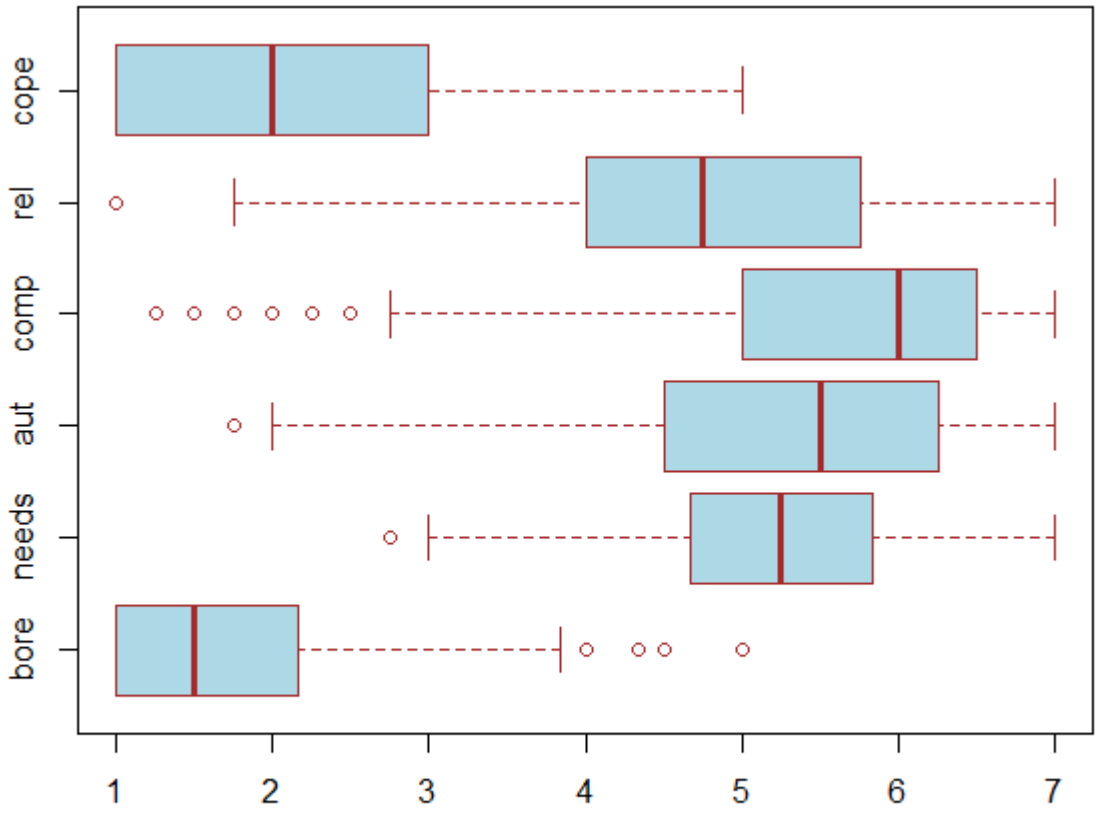
The survey used for the collection of the data includes other questionnaires used in other studies related to the basic psychological needs. This method is used in order to increase the number of participants from convenience sampling.

Eventhough the data collection has already started, I neither have access to the data yet, since the shared questionnaire is not managed by me and furthermore, at the time of writing, there is not enough data yet so that the cross-lagged panel design can be used.

Available at https://aspredicted.org/xa8a6.pdf

Appendix B (Graphics and Tables)

Boxplot to display sample distributions of the measured variables in the active study



Note. aut = 'Autonomy'; bore = 'Boredom'; comp = 'Competence'; cope = 'Coping'; needs = 'Need satisfaction'; rel = 'Relatedness'

Within-subject and Between-subject correlations of measured variable in the active study sample.

	BORE	*NEEDS*	*AUT*	*COMP*	*REL*	*COPE*
BORE		-0.48***	-0.19***	-0.46***	-0.40***	0.15***
NEEDS	-0.49***		0.69***	0.78**	0.77***	-0.18***
AUT	-0.22***	0.72***		0.33***	0.26***	-0.20***
COMP	-0.46***	0.79***	0.38***		0.42***	-0.1
REL	-0.40***	0.74***	0.26***	0.39***		-0.1
COPE	0.19***	-0.17***	-0.19***	-0.10*	-0.11*	

$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$

Note. Upper-Triangle: Within-Person Correlations. *Lower-Triangle:* Between-Person. aut = 'Autonomy'; bore = 'Boredom'; comp = 'Competence'; cope = 'Coping'; needs = 'Need satisfaction'; rel = 'Relatedness'

Appendix C (Declaration of Independence)

I hereby certify that I have written this thesis independently and have not used any other any aids other than those specified. The passages that are taken from other works have been taken verbatim or analogously, I have indicated the source and adhered to the rules of scientific (APA) citation. This assurance also includes illustrations, tables, sketches and drawings used in the work, sketches and drawings. I have also used the following generative AI-tools for the preparation of the thesis: ChatGPT, Gemini, Grammarly and DeepL. I have used them for the following purpose:

- Generation of initial ideas
- Aid for statistical analysis
- Translation
- Grammar
- Aid for structural-cohesive text
- Rewriting of passages using redundant wording

Appendix C (German Abstract)

Abstract German

Langeweile ist ein negativer emotionaler Zustand, für den es bereits seit langem eine Vielzahl von Forschungsarbeiten gibt. Langeweile am Arbeitsplatz ist zwar kein neues Konzept, wurde aber im Vergleich zur gesamten Langeweile-Literatur in der Forschung vernachlässigt, insbesondere wenn es um die negativen Auswirkungen auf Einzelpersonen und Organisationen geht, nämlich geringeres Wohlbefindens, geringere Lebenszufriedenheit, geringere Arbeitszufriedenheit und höhere Fehlzeitenquote. Darüber hinaus bieten die jüngsten Fortschritte in den Motivationstheorien, wie die Selbstbestimmungstheorie (SDT), einen theoretischen Rahmen dafür, wie Langeweile und Bedürfnisbefriedigung miteinander verknüpft sein könnten. Die Theorie der psychologischen Grundbedürfnisse, eine Minitheorie der SDT, geht davon aus, dass die Befriedigung der drei psychologischen Grundbedürfnisse nach Autonomie, Kompetenz und Verbundenheit Motivation, Wohlbefinden und Produktivität vorhersagt. In diesem Artikel wird die bidirektionale Beziehung zwischen den beiden Konstrukten mit Hilfe eines Cross-Lagged-Panel-Modellierungsansatzes untersucht, um mehr Licht auf beide Themen zu werfen und möglicherweise einen Weg zu finden, wie Mitarbeiter und Organisationen von einer Reduktion von Langeweile und der Steigerung der Bedürfnisbefriedigung profitieren können. Fünfundneunzig Arbeitnehmer*innen, die mindestens zwanzig Stunden pro Woche arbeiten, nahmen an einer Online-Tagebuchstudie teil. Im Gegensatz zu den postulierten Hypothesen wurde kein negativer Zusammenhang zwischen Langeweile und psychologischen Grundbedürfnissen festgestellt, unabhängig von der Richtung des Einflusses. Bei der Betrachtung der aktiven Bewältigung als Moderator wurde kein Einfluss auf die Beziehung festgestellt. Die Implikationen dieser Ergebnisse werden diskutiert.