Crafting and human energy: Needs-based crafting efforts across life domains shape employees' daily energy trajectories

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Accepted for publication in the Journal of Occupational Health Psychology

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Abstract

We use experience sampling methodology and adopt the integrative needs model of crafting to investigate employees' daily energy trajectories, and to test whether employees' energy can be conserved or increased throughout the day through the proactive behavioral strategy of needs-based crafting. We first examine the daily trajectories of energy and then investigate the role of employees' daily crafting efforts (at work and in their private lives) in managing their energy throughout the day. Finally, we explore the daily within-person trajectories of needs-based crafting. We tested our hypotheses on a sample of 110 employees providing data on four non-consecutive days (resulting in 2,358 observations nested in 396 days). Continuous growth curve analyses confirmed that energy follows an inverted U-shaped pattern of increasing energy until noon, after which energy steadily decreased until bedtime. However, daily crafting efforts contributed to these change trajectories: On days when employees crafted more than average, their energy was higher, particularly in the morning and afternoon. These positive crafting effects disappeared towards the end of the day, before bedtime. Crafting followed a linear trajectory, increasing over the course of the day, suggesting that it is a proactive strategy people also engage in outside of work. This suggests that domain-spanning needs-based crafting could be an important proactive strategy to maintain higher energy throughout an entire working day, even in the afternoon, when energy normally starts to fall. Our research contributes to our understanding of the nature of energy and of the micro-dynamic, within-person energy effects of general crafting efforts.

Keywords: needs-based crafting, human energy, change trajectories, energy management

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Energy - feeling vital and alive during the course of a day is central to people's well-being and optimal functioning (Ryan & Deci, 2008; Ryan & Frederick, 1997). According to Hockey´s (2013) motivational control theory, daily energy constitutes the motivational basis to persevere in one´s work tasks and exert effort. However, employees´ engagement in work-related activities tends to deplete their daily energy, leaving them feeling increasingly tired, more distracted, and less willing to continue investing effort in tasks as the work day progresses (Hockey, 2011; Quinn et al., 2012). Researchers (e.g., Fritz et al., 2013; Zacher et al., 2014) have proposed various self-regulatory energy management strategies and break activities (e.g., micro-breaks) as potential ways to replenish lost energy during the day and to maintain more constant, high energy at work.

However, these micro- and short breaks from work may not suffice to successfully maintain and enhance employees' energy over the course of the day if opportunities to take such breaks are limited or if the break activities and break schedules do not align with their personal needs. Job crafting is an example of an energy management strategy, where employees make self-initiated changes to their work to align it with their personal needs and goals (Tims & Bakker, 2010; Wrzesniewski & Dutton, 2001). Consistent crafting throughout the day, at self-chosen moments at work or in private life, may help to maintain or even generate new energy over time. In support of this notion, proactivity research (Cangiano et al., 2019; Cangiano & Parker, 2015; Parker et al., 2010) has proposed that employees can and do enhance their daily energy by proactively engaging in activities that are personally meaningful to them and support their psychological needs satisfaction. This line of research proposes that in addition to investigating activities that employees seemingly randomly engage in during their work breaks, research should also focus on the underlying

psychological mechanisms that assist employees in their daily efforts to manage their energy, and on their purposeful behaviors to conserve and increase their energy. What is more, these proactive processes may occur both at work and outside work.

One relatively new and promising proactive energy-regulating behavior is integrative needs-based crafting. This form of crafting entails people making deliberate changes in their daily work and private activities to meet their intrinsic goals and satisfy their personal needs (De Bloom et al., 2020). Needs-based crafting may thus take place both during employees´ working hours and during their non-work time (e.g., evenings after work, weekends). Until now, research has mainly focused either on crafting in the work or the non-work domain, often using cross-sectional research designs. We propose that a broader, more parsimonious crafting perspective subsuming all life domains is needed to understand the dynamic fluctuations in people's behaviors and energy, resonating with the fact that flexible work practices have become ubiquitous. During telework, for example, boundaries between life domains become increasingly blurred and people frequently transition between various roles and identities throughout the day (Delanoeije et al., 2019; Vaziri et al., 2020). It is therefore important to integrate this life domain-independent, integrative framework to crafting research and study how crafting influences fluctuations in employees' daily energy in an experience sampling methodology.

The integrative needs model of crafting (de Bloom et al., 2020) constitutes a life domain-independent crafting framework which can cover crafting processes occurring throughout the entire day because it is grounded in psychological needs. According to this model, psychological needs underlie crafting processes and actual crafting efforts may occur in any life domain and address six domain-transcending needs. Psychological needs thus motivate employees to engage in crafting efforts and needs satisfaction serves as experiential reward after a crafting episode. The six underlying psychological needs of this model are

detachment, relaxation, autonomy, mastery, meaning, and affiliation (Newman et al., 2014). Crafting efforts aim to satisfy these needs, thereby potentially shaping employees´ energy over the course of the day.

While self-determination theory supports the notion of intrinsically satisfying behaviors being energy-enhancing via psychological needs satisfaction (Ryan & Deci, 2008), little is known so far about whether needs-based crafting as a daily energy management strategy is indeed effective. There is a large body of literature on people's overall levels of job crafting based on cross-sectional research (for meta-analyses, see for instance Rudolph et al., 2017; Tims et al., 2021), or day-level studies (e.g., Bakker & Oerlemans, 2019; Demerouti et al., 2019; Tims et al., 2014), but detailed analyses scrutinizing the dynamic nature of crafting behaviors over the course of the day are still rare (Weisman et al., 2022). It is important to address this gap in research, because the literature suggests that at work daily energy tends to decline as the day progresses, potentially resulting in poorer concentration and motivation during afternoon tasks (Riley et al., 2017; Valdez, 2019). Indeed, energy throughout the day is shaped by the 24-hour circadian rhythm (e.g., Dijk et al., 1992), and fluctuates in a cyclical manner that follows an inverted U-shaped pattern (Hülsheger, 2016). We propose, however, that people who craft can, to some extent, override biology and contribute to their positive energetic activation. That is, we suggest that needs-based crafting represents a behavioral strategy that affects energetic activation and thereby helps to maintain or even improve people's energy trajectories across the day.

In conclusion, by focusing on domain-independent needs-based crafting, the goal of the present study is to explore needs-based crafting efforts over the course of the day and to relate crafting to the within-person change trajectories of employees' energy. We do so by first investigating the general individual change trajectories in energy across days, and second, by studying day-level crafting as the behavioral strategy which may explain the

variation in energy trajectories. In doing so, we contribute to a better understanding of behaviors that can affect the fluctuations in employees' energy across the day. Notably, we rely on an experience sampling methodology to examine our propositions, allowing us to assess ecological momentary crafting and energy repeatedly during the day (ESM; Larson & Csikszentmihalyi, 1983). This approach is well suited to capturing systematic within-person variations in energy and crafting, referred to as trajectories. We thus study change processes in energy and needs-based crafting within the same persons across different time frames during the day (Beal & Weiss, 2003).

The present study contributes to the literature in three ways. First, we contribute to the research on human energy by exploring the role of employees' crafting in shaping energy trajectories across the day. We aim to show that while energy in general follows people´s underlying natural circadian rhythm, employees can proactively manage their energy by engaging in needs-based crafting behaviors. By introducing needs-based crafting as a behavioral strategy in employees' daily energy management, we add to the existing body of knowledge on break activities and energy management strategies which remained relatively mute on the underlying psychological processes. Second, by studying needs-based crafting over the course of the entire day and across life domains in an integrated way, we align our research with the newly emerging, integrative life domain-spanning perspective on crafting (De Bloom et al., 2020). This will ultimately provide a richer domain-independent perspective on daily crafting processes compared to more static research focusing on either the job or the off-job domain. Third, by adopting a temporal approach and using an experience sampling methodology to study dynamic needs-based crafting efforts and energy trajectories, we examine within-person daily changes that are not yet well understood. This knowledge can assist researchers and practitioners in further developing effective theory-driven crafting interventions (Rauvola et al., 2020).

Theory and Hypotheses

Development of Energy across Day

Daily energy is a concept that has been consistently linked to important human health and performance outcomes. In work and organizational psychology, various concepts such as subjective vitality (Ryan & Frederick, 1997), work engagement (Schaufeli, 2012), exhaustion (Frone & Tidwell, 2015), and fatigue (Sonnentag et al., 2008) have been used as proxies when describing employees' energy at work.

Vitality refers to the subjective experience of feeling alive and full of energy in general (Ryan & Frederick, 1997). In the work domain, vigor, the behavioral-energetic dimension of work engagement describes high energy and willingness to continue investing effort to one's work (Schaufeli, 2012). Vitality and vigor thus refer to energetic activation, defined as "the subjective component of a biobehavioral system of activation, experienced as feelings of vitality, vigor, or enthusiasm." (Quinn et al., 2012). This energy activation reflects how much of their existing physical energy (e.g., ATP and glucose) people are willing to invest in different activities (Quinn et al., 2012). Energy therefore lies at the basis of people´s motivation to engage in any kind of behavior, but particularly effortful work-related behaviors that are not necessarily rewarding in themselves (Hockey, 2011). In experience sampling methodology studies this energetic activation can be validly assessed with a pictorial scale of human energy (Weigelt et al., 2022) that converges strongly with both vitality and vigor.

An important aspect affecting energy trajectories across the day is the 24-hour circadian rhythm. Research on circadian rhythms has shown that human body temperature systematically varies across the day, and that similar cyclical patterns can be observed in alertness and cognitive performance (Carrier & Monk, 2000; Dijk et al., 1992; Kleitman & Jackson, 1950). Namely, participants' alertness and performance were shown to be low in the

morning, reaching its peak by midday and decreasing in the evening. More recently and in support of these diurnal patterns, Hülsheger (2016) showed that fatigue, a state of tiredness and exhaustion, followed a similar energy pattern over the course of the day, by first decreasing until midday, followed by an increase of fatigue until late evening. Given the empirical evidence about the cyclical patterns of human energy over the course of the day, we hypothesize that:

Hypothesis 1: Employees' energy follows an inverted U-shape trajectory across the day such that energy initially increases during the first half of the day and then decreases towards the end of the day.

Crafting Behaviors to Enhance Daily Energy

Besides the circadian rhythms shaping human energy patterns, people's behaviors may contribute to how energized they feel at any given point in time. For example, employees may use different energy management strategies during their work breaks to manage their energy during working days, such as taking micro-breaks (Zacher et al., 2014). However, scholars propose that it is not only important to take breaks to regulate one's energy but also that the content of these breaks matters (Trougakos & Hideg, 2009). Moreover, research has shown that instead of taking work breaks at times when employees need them most, people tend to treat work breaks as rewards after completing a work task (Bosch & Sonnentag, 2018). This means, employees may not naturally make optimal use of micro breaks to manage their energy.

Hockey's (2011a) motivational control theory of cognitive fatigue posits that engagement in self-initiated activities consistent with employees' goals can prevent fatigue from occurring at work. People can thereby self-regulate their energy by engaging in self-initiated, goal-directed behaviors that lead to changes in a desired direction (Parker et al., 2010). Cangiano and colleagues (2019) proposed an energy-generating pathway of proactive

behaviors by showing that on days when workers are more proactive, they also experience higher energy through perceived competence. While being proactive does also require resources, such as time and effort, such behaviors can still have an energizing effect on employees if they are autonomously motivated and personally rewarding (Cangiano et al., 2021; Hockey, 2011). In this way, intrinsically driven proactive behavior can help to maintain or enhance energy, while behaviors that are externally motivated or controlled may lead to resource depletion and lower energy (Moller et al., 2006; Ryan & Deci, 2008). Therefore, engaging in behaviors consistent with one's needs and personal goals can help employees to manage their energy across the day.

In the work setting, research has demonstrated that employees can and do proactively modify their job, known as job crafting (Berg et al., 2010; Tims & Bakker, 2010; Wrzesniewski & Dutton, 2001). Such crafting is a way to boost one's resources at work, as has been demonstrated in various studies (for an overview, see Rudolph et al., 2017; Zhang & Parker, 2019) and according to the Job Demands-Resources (JD-R) model, such job resources can have intrinsic motivating potential, leading to psychological needs satisfaction and feeling more energized (Bakker & Demerouti, 2007). While psychological needs were described as potential motivational drivers of job crafting already in the early crafting conceptualizations (Wrzesniewski & Dutton, 2001), so far, limited attempts have been made to measure crafting from a needs' perspective and throughout the entire day. In contrast to earlier job crafting frameworks that emphasize specific behaviors (e.g., Tims & Bakker, 2010), needs-based crafting specifically focuses on employees attempts to shape their behavior in line with their psychological needs, which make it suitable when studying dynamic patterns of energy changes throughout the day. Initial evidence from cross-sectional studies and diary studies shows that self-initiated activities associated with meaning, learning new things, and close relationships with others are beneficial activities in terms of conserving

and generating new subjectively perceived energy during and after work breaks (Fritz et al., 2011; Kinnunen et al., 2015; S. L. Parker et al., 2017; Schulz et al., 2017; Zacher et al., 2014). Furthermore, research has shown that certain experiences during non-work time, when limited or even no job demands are present, can help employees to regain lost resources and gain additional resources (Meijman & Mulder, 1998; Sonnentag et al., 2008; Sonnentag & Fritz, 2007). These experiences of detachment from work, relaxation, control, and mastery have been positively associated with higher day-level energy (i.e., higher vitality and lower fatigue) among employees (Weigelt et al., 2021). While there is a large body of literature showing the benefits of these experiences for energizing people (Bennett et al., 2018; Sonnentag et al., 2022), the active role that people may play in purposefully creating these experiences is still poorly understood. Only recently, an emerging body of research on off-job crafting has indeed shown that people can and do engage in certain activities that can benefit their energy (Pijpker et al., 2022). Importantly, in addition to the four well-established recovery experiences (detachment, relaxation, control, mastery), Kujanpää and colleagues (2021) recently showed that people can also craft experiences of meaning and affiliation, which in turn were also positively related to increases in vitality, which is very similar to energetic activation.

Taken together, a growing body of research suggests that employees can proactively shape their work, work breaks, and non-work activities in accordance with their psychological needs to maintain and enhance their energy. We applied the Identity-Based Integrative Needs Model of Crafting (De Bloom et al., 2020) to gain a domain-independent holistic picture of the effects of employees' crafting behaviors on their energy trajectories over the course of the day. Given the empirical evidence that the six psychological needs (i.e., detachment, relaxation, autonomy/control, mastery, meaning, and affiliation) are important for enhancing employees' well-being (Kujanpää et al., 2020; Newman et al., 2014),

we expected that needs-based crafting aimed at satisfying these six needs shapes the trajectory of energy across the day. While there is growing evidence of the long-term well-being benefits of needs-satisfying behaviors, little is known about the short-term benefits of such behaviors on an everyday basis. Energy is an extremely dynamic well-being outcome that changes cyclically over short periods of time. The short-term effects of crafting on energetic activation may thus also contribute to employees achieving more long-term well-being goals. Therefore, we propose the following hypothesis:

Hypothesis 2: The trajectory of energy across the day depends on employees' needs-based crafting efforts. When day-level crafting is low, we expect the energy trajectory to follow a stable inverted U-shaped trajectory reflecting people´s regular circadian pattern of energy. When day-level crafting is high, we expect higher average energy over the course of the day and particularly a less steep decrease during the second half of the day.

Daily Crafting Trajectories

While recent diary studies about crafting (i.e., Demerouti et al., 2019; Shi et al., 2021) have contributed to our understanding of day-level crafting and its associations with day-level well-being outcomes, little is known about crafting patterns unfolding over the course of the day.

For instance, research has shown that during weekends, people can choose more freely what they want to do and experience closer connection to others than during working days (Ryan et al., 2010). Therefore, one would expect crafting to increase across the day during workdays, peak in the evening, and stay relatively high and stable at weekends. On the other hand, while weekends enable employees to spend more time in ways they prefer compared to regular weekdays, people may still have non-work obligations that may impede their crafting efforts (Fritz et al., 2010). Family obligations, housework, and practical errands may leave less time for crafting also during the first half of a weekend day. In fact, a time use

survey conducted in the Netherlands (Roeters & Vlasblom, 2019) showed that on Saturday morning at 10:00, only a quarter of the people (23%) engaged in leisure activities while 37% engaged in personal care (including sleep) and 28% engaged in activities of an obligatory nature, such as household chores or care duties. Engagement in household and care duties remained at around 30% over the course of the morning and afternoon, followed by a decrease starting in the late afternoon. By 21:00, 77% of Dutch people were engaged in leisure activities while 11% engaged in personal care and only 7% reported household chores and care duties. Time use research thus indicates that employees may simply have fewer opportunities to craft during the first half of the day and more crafting opportunities arising in the evening regardless of the day of week.

The states of employees' psychological needs can moreover shape daily crafting trajectories. The Integrative Needs Model of Crafting (De Bloom et al., 2020) proposes two potential pathways through which past crafting efforts may influence future crafting behaviors. On the one hand, when crafting is used as a strategy to reduce discrepancy between one's actual and desired needs satisfaction, a successful crafting event during the first half of the day could lead to a consequent decrease in crafting behaviors since the desired needs satisfaction has been achieved. On the other hand, resource gains from successful crafting efforts during the first half of the day could also energize people to continue crafting throughout the day to experience even more positive outcomes (e.g., needs satisfaction). Similar processes have been referred to as gain spirals in research on job resources and work engagement (Hakanen et al., 2008; Salanova et al., 2010).

Towards the end of the day, after people have often spent a significant amount of their resources in complying with various job and home demands, their crafting efforts may also decrease. People may find engaging in self-regulatory behaviors such as crafting simply too effortful. Similarly to a "recovery paradox", a situation where employees could benefit most

from recovery but are least likely to engage in recovery-enhancing activities (Sonnentag, 2018), a person who could gain from crafting behaviors would instead opt to engage in less effortful, extrinsically motivated behaviors as their self-regulatory resources are already depleted. For example, instead of making plans with friends to experience affiliation or exercising to experience detachment and/or mastery in the evening, a person may choose more passive activities such as mindless scrolling on the phone.

Taken together, needs-based crafting is assumed to follow a pattern of systematic increase or decrease, or even a more cyclical trajectory over the course of the day. Therefore, we pose the following exploratory research question:

Research Question 1: How does needs-based crafting systematically change over the course of the day?

Methods

Participants and procedure

The sample consisted of full-time workers recruited from the personal networks of a group of students at the University of Groningen. To be eligible, participants were required a) to work regular work hours (minimum 24 hours a week, Monday to Friday), b) to work during two of the predefined measurement days (Tuesday and Wednesday), c) to have no planned holidays during the measurement weeks and d) to own a smartphone that allowed them to use the experience sampling platform (ExpiWell). The study was conducted in English, Dutch, or German; participants were therefore also required to speak one of these languages. Participants received no remuneration for their participation.

Altogether, 186 persons responded to the study invitation by providing their name, email address, and language preference. These participants received an email with further information about the study and the data protection guidelines. Additionally, each person

received a personal link to a baseline questionnaire in Qualtrics. The experience sampling measurements started a week after participants had completed the baseline questionnaire. During the first week, the experience sampling measurements took place on Tuesday and Saturday, and during the second week on Wednesday and Sunday. Different days over the two weeks were selected to reduce the response burden and gain a fuller picture of participants' weekly routines. Both weekdays and weekend days were included in the study to explore if peoples' crafting trajectories differ during days of the week that are either focused on work-related or leisure activities. On each measurement day, participants received eight electronic surveys in the ExpiWell app, each scheduled two hours apart and each available for one hour. A reminder was scheduled at the 30-minute mark of each survey's response window. We applied a fixed survey schedule but varied the time of the first survey on each day. The precise schedule is shown in Figure 1.

Altogether, 140 participants completed the baseline questionnaire in Qualtrics. Of these, 110 provided at least one experience sampling measurement, resulting in 2,358 measurements nested in 396 days nested in 110 participants. On average, participants completed 21.4 surveys per person out of a possible 32 surveys, resulting in a response rate of 66.9%.

On average, participants worked 39.5 hours a week (*SD* = 8.2) and had worked for their current employers for 7.9 years (*SD* = 8.9) and in their current position for 6.5 years (*SD* = 8.5). Of the respondents 70.9% had a permanent employment contract and 24.5% worked in a managerial position. Participants reported that on average, they currently worked 51.6% of their working time remotely (*SD* = 40.0). Participants worked in various sectors, including healthcare and social services (13.6%), information technology (10.9%), trade (7.3%), (public) administration (7.3%), and engineering (7.3%). Over half of the participants were males (54.5%). The average age of the participants was 40.4 years (*SD* = 14.2) and 30.0%

had completed high school or equivalent and 70.0% had a higher education degree. Over half of the participants lived in Germany (53.6%), followed by the Netherlands (29.1%), and Belgium (3.6%). Those living alone included 20.9%, those living with a partner 33.6%, and those living with a partner and at least one child 31.8%. For the responses 54.5% of participants used German, 22.7% Dutch, and 22.7% English.

Measures

Data collection consisted of a baseline survey and 32 experience sampling surveys (eight per day over four days). The baseline survey contained questions about the demographic variables (i.e., age, gender, tenure), and personal and work characteristics. Energy was measured at all measurement points while crafting was measured in every other survey. Hence, crafting was measured at the 1st, 3rd, 5th, and 7th measurement points of the day. All items were presented in English, Dutch, or German, depending on the participant's language preference on recruitment. Whenever available, we used translations of the scales validated in the Dutch and German samples. For the scales of which there were no translations available, native speakers first translated them and other native speakers and experts in the field checked the translations.

Time and context. Time of response was recorded automatically by the ExpiWell platform at each measurement. Additionally, at each measurement, we asked participants to indicate how they would characterize the previous two hours. The response options were (mainly) work, unsure/both, and (mainly) off-job time.

Energy was measured with the single-item Pictorial Scale of Human Energy (Weigelt et al., 2022). Participants were asked to indicate which symbol best represented their energy over the past two hours. We used the black and white version of the pictorial scale with response

options ranging from 1 (a battery icon with one bar) to 5 (full battery with five bars; Lambusch et al., 2020).

Needs-based Crafting was assessed with an adapted short version of the needs-based off-job crafting scale (NOCS; Kujanpää et al., 2022). The six-item version of the scale was adapted to capture crafting in both job and off-job domain. [1] Crafting for each DRAMMA need was measured by one item. Example items are "Over the past two hours…" "… I've made sure to detach from work-related thoughts (during my breaks)." (detachment), "… I've made sure to experience relaxation of my body and mind (during my breaks)." (relaxation), "… I've organized my activities so that I determine my own course of action." (autonomy), "… I've organized my activities so that I put my skills, knowledge, or abilities into action." (mastery), "… I've organized my activities so that I achieve a sense of purpose in what I was doing." (meaning), and "…I've made sure to experience close connections to the people around me." (affiliation). Response options ranged from 1 (strongly disagree) to 5 (strongly agree). Items were averaged to create a composite measure of crafting at each measurement point.

Analytic Approach

We analyzed the data using a growth modeling approach, as described by Bliese and Ployhart (2002) to estimate the multilevel regression models in R, using the "nlme" library (Pinheiro & Bates, 2000). We used restricted maximum likelihood for estimation. The data have a three-level nested structure where surveys (Level 1) are nested within days (Level 2), and days are nested within persons (Level 3). In our analyses, we predicted changes in energy and needs-based crafting across the day. Trajectories were created based on exact clock time (the time of responding to the survey). We used clock time centered at 12:00 (noon) to predict the

[1] Needs-based crafting was measured with the same six context-free items. However, when participants indicated having spent the past two hours (mainly) at work, crafting items for detachment and relaxation contained the addition of "during my breaks". This addition was omitted from these two items when participants reported that the past two hours were (mainly) off-job time or unsure/both.

daily change trajectories. We centered time around noon to reflect energy at its expected daily peak. We specified separate three-level models for each outcome variable. First, we specified growth curve models to investigate change trajectories of energy across the day and the role of day-level needs-based crafting as a predictor of change in the energy trajectory. Starting with the unconditional growth model testing the linear and quadratic time trends[2] specified as random at day and person level (Bliese & Ployhart, 2002), we proceeded to test more complex models by adding needs-based crafting as a covariate in the model. We also tested whether the specifications of autocorrelation and heteroscedasticity improved model fit and, if necessary, included these specifications in the model (Bliese & Ployhart, 2002). Finally, we proceeded to test the cross-level interaction between the time trends and aggregated (at the day-level) needs-based crafting. Following the guidelines of Raudenbush and Bryk (2002) we modeled between-person and within-person effects by including crafting as both a person-specific crafting variable (i.e., grand-mean centered person mean to reflect the person-specific level of crafting across all self-reports of a person) and a day-specific crafting variable (i.e., person-mean centered day mean to reflect individual's day-specific levels of crafting). Additionally, we specified separate growth curve models to investigate the change trajectories of needs-based crafting over the course of the day.

Results

Data Screening and Preliminary Analyses

Data cleaning, assumption checking, and descriptive statistics were completed in SPSS Statistics version 26 (IBM Corp, 2019). Means, standard deviations, zero-order correlations among the focal variables on three levels are presented in Table 1.

[2] Following the recommendations of Biesanz et al. (2004), we used raw rather than orthogonalized polynomials.

Next, we estimated multilevel McDonald's Omega for the needs-based crafting scale (Geldhof et al., 2014). Multilevel McDonald's Omega for needs-based crafting at the within-person level was .59 and at the between-person level .71.[3]

Before testing our hypotheses, we ascertained that there was substantial variance at all three levels and estimated a null model for each variable (Bliese & Ployhart, 2002). The intraclass correlation coefficients showed that 22% of the variation in energy was between-persons variance, while 13% of variance was between-day, and 65% was within-day variance. For needs-based crafting, the intraclass coefficients showed that 12% of total variance was between-person, 14% between-day, and 74% within-day variance.

Hypothesis Testing

The unconditional growth model (Table 2, Model 1) showed a non-significant linear (γ = 0.01, *SE* = 0.01, *t* = 0.75, *p* = .454) and a significant quadratic time trend for energy within day (γ = −0.01, *SE* = 0.00, *t* = −7.83, *p* < .001), indicating that energy systematically changed over the course of the day across individuals and days by first increasing during the first half of the day and then decreasing in the second half of the day. This inverted U-shaped pattern is shown in Figure 2. Hypothesis 1 was therefore supported.

Model 2 (Table 2) included daily needs-based crafting as a cross-level moderator of the energy change trajectory. We found a significant cross-level interaction between quadratic time trend and day-specific crafting on energy, showing that change patterns in energy differed depending on whether the person had crafted more or less than their average (γ = -0.01, *SE* = 0.00, *t* = -2.14, *p* = .033). As we show in Figure 3, on days when a person

[3] Given the formative and domain-independent nature of the needs-based crafting construct, McDonald's Omega may not be optimal for assessing reliability. While all six items measure proactive efforts to satisfy psychological needs, crafting for certain needs does not necessarily have to happen at the same time. For example, higher crafting efforts for detachment may not occur simultaneously with higher crafting efforts for mastery or meaning. Given the heterogeneity the content in the items and aligning with Nezlek (2017), cut-off criteria for the within-person reliability of this scale can be more relaxed than for between-person trait level variables.

had crafted more than usual, their energy was higher and the trajectory over the day followed a steeper curve with a more pronounced decrease in the evening than on the days when a person had crafted less. The cross-level interaction between quadratic time trend and crafting at the person-level on energy was non-significant, indicating that the energy trajectory over the day did not differ for people who crafted more or less than an average person. We therefore found partial support for Hypothesis 2; while the energy trajectory followed a higher trajectory over the course of the day on days when people crafted more, they also experienced a more pronounced decrease in energy over the course of the evening.

To answer Research Question 1 about the trajectories of needs-based crafting over the course of the day, we specified a model where crafting was entered as the outcome variable (Table 3). We identified a significant linear (γ = 0.03, *SE* = 0.00, *t* = 6.54, $p < .001$) time trend indicating that crafting increased systematically over the course of the day (see Figure 4).[4]

Additional analyses

To further explore our findings, we conducted additional analyses. First, we compared crafting patterns during weekdays and weekend days. We found a significant cross-level interaction between linear time and day (γ = -0.02, *SE* = 0.01, *t* = -2.49), indicating differences in crafting trajectories between weekdays and weekend days. As we show in Table 3 and Figure 5, the increase in crafting behaviors across the day was steeper on weekdays than on weekend days. During the weekend days, crafting at noon was greater than on working days and followed a more stable trajectory than during weekdays. Second, we explored if specific crafting strategies are used at certain times (i.e., in work and non-work context) by comparing the means of each DRAMMA dimension in the work and non-work

[4] A model with quadratic time trend was also tested, but the quadratic time trend was non-significant and adding the term to the model did not improve the model fit.

context. The analyses revealed that in the work context, people crafted significantly more for mastery and significantly less for detachment, relaxation, autonomy, and affiliation than in the non-work context. Differences in crafting for meaning were non-significant. The detailed results of the analyses can be found in Table S1 and Figure S1 in the supplemental materials. Third, we explored if people addressed different needs on high compared to low crafting days. The means for each DRAMMA dimension on high and low crafting days are presented in Table S2 and Figure S2 in the supplemental materials. We found that crafting for autonomy had the highest mean score and crafting for mastery the lowest mean score on both low and high crafting days. In terms of changes between high and low crafting days, crafting for meaning showed most stability whereas crafting for autonomy increased most.

Discussion

In this study, we explored employees' crafting efforts as a behavior maintaining and enhancing their daily energy. We utilized experience sampling methodology to investigate the individual change trajectories of energy over the course of the day in a real-life setting and examined how day-level crafting influences the trajectory of energy across the day.

Firstly, in line with research on chronobiology and circadian rhythms (Carrier & Monk, 2000; Dijk et al., 1992), our data analyses confirmed that employees' energy follows an inverted U-shaped trajectory over the course of the day, mirroring the findings of Hülsheger (2016) that employees' fatigue follows a U-shaped pattern of first decreasing over the course of the morning until noon and then increasing until the end of day. Our study contributes to energy research by shedding light on the daily trajectory of positive energetic activation (i.e., vigor and vitality). While fatigue and exhaustion have often been treated as conceptual opposites of high energy, research suggests that they might not belong to the same continuum and people can even simultaneously experience high vigor and high exhaustion (Mäkikangas et al., 2012). Therefore, it was crucial to also examine patterns of energy and

not simply assuming that the patterns will be opposite to fatigue. Importantly, we found that day-level crafting constitutes a boundary condition that shapes and changes the natural daily patterns in energy. Specifically, on days when employees reported higher day-level crafting efforts than their average, their energy was considerably higher, particularly in the morning and afternoon, than on days when they reported lower daily crafting efforts. This aligns with our theoretical reasoning proposing that crafting may help working people to generate and conserve energy which may in turn motivate them and help them to remain engaged in effortful work-related behaviors.

Contrary to our expectations, the energy trajectory over the second half of the day was not characterized by sustained energy (i.e., flatter energy decrease) on days when employees had crafted more than their average. Instead, the positive effects of crafting seemed to wear off towards the end of the day and employees reached low energy by the end of the day similar to days when they crafted less. This finding is in line with the human circadian rhythm (Carrier & Monk, 2000), but suggests that meaningful proactive behaviors can enhance and sustain employees' daily energy (Cangiano & Parker, 2015) up to the end of the day, when rest is desired after engagement in effortful tasks (Åkerstedt, 2007). On days when employees craft more, it can help them to optimally regulate their energy. It seems that employees are able to feel more energized during the time of day when positive energetic activation is most beneficial for them but by the end of the evening, their energy still reaches similar levels as on days when they had crafted less, potentially helping them to unwind and prepare for replenishing their energy via sleep. Moreover, our finding that on days when people crafted more, their energy followed a steeper decrease around bedtime sparks interesting insights on the relationship between time, crafting, and the nature of energy. Whereas some theories (e.g., self-determination theory; Ryan & Deci, 2000) would argue that energy can be newly created and is basically endless, our findings, aligning with set-point

theories of happiness and well-being, suggest that energy is a finite resource that goes down at the end of the day, irrespective of a person´s behavior.

Second, we found that integrative crafting across the day follows a positive linear trajectory. That crafting increased over the course of the day supports earlier gain spiral findings, showing that employees' successful crafting efforts during the first half of the day may energize them to continue crafting during the second half of the day to experience even more positive psychological outcomes (i.e., better needs satisfaction, Hakanen et al., 2008). Interestingly, however, the linear effect was more pronounced on weekdays. During weekends, people's crafting trajectory was higher and more stable across the board, suggesting that compared to weekdays, employees may have and seize more opportunities to craft. Somewhat surprisingly, we do not see the linear increases in crafting efforts reflected in increases of energy. Instead, on days when people craft more, they benefit most during mornings and afternoons, but not in the evening, when crafting is at its highest. Overall, it seems that high engagement in crafting is beneficial, but increases do not seem to add much.

Finally, our additional analyses indicated that there were differences in crafting for specific needs in the work context compared to the non-work context. Specifically, people crafted more for mastery and less for detachment, relaxation, autonomy, and affiliation in the work context. This is partially in line with Ryan et al.'s (2010) findings that work experiences provided people with lower satisfaction of autonomy and relatedness needs than non-work activities.

Theoretical Implications

Feeling energized at work is key to employees' for well-being and performance (e.g., Binnewies et al., 2009; Quinn et al., 2012). A more thorough understanding of people´s own proactive contribution is therefore important for organizational success. Our findings offer novel insights into within-day changes in energy and showing that daily crafting is an

important boundary condition that shapes workers´ daily energy trajectories. Investigating the daily energy trajectory allowed us not only to show within-person differences at a certain time of the day but also to examine differential trajectories linked to crafting behaviors, revealing when human energy reaches its peak and its lowest points and, most importantly, how employees' day-level crafting efforts can help employees to maintain their energy. Our finding about considerable within-day variability in people's energy can also assist researchers when designing organizational interventions. For example, some interventions may not be as effective when conducted at certain times of the day. In addition, our parsimonious way to capture crafting processes occurring both at work and in private life provided us with detailed information on people's daily crafting patterns. Our methodological approach and the needs-based crafting framework helped to shed light on the complete within-person change trajectory of crafting from waking up until going to bed, contributing to exploring the role of time in crafting research (Weisman et al., 2022).

More generally, the integrative needs-based model of crafting (De Bloom et al., 2020), which lies at the heart of our study, ties together different streams of research. For instance, the literature on energy management captures particular behaviors that people engage in during their day to conserve or generate energy, yet linkages to outcomes such as well-being and performance have been inconsistent across studies. Similarly, inconsistent results emerge when (micro-)breaks or recovery activities are studied (for reviews, see Sonnentag et al., 2017; Steed et al., 2021), or when behavioral crafting strategies that directly focus on reducing job demands are considered (Rudolph et al., 2017). This earlier work may have yielded more consistent findings when taking into account the psychological motivations explaining *why* people engage in certain behaviors. People may engage in the same crafting behavior, but still report different levels of energy, depending on whether this activity satisfied their psychological needs. For instance, when three people exercise, the first

person may do this to control their weight, the second may do it for social interaction, and the third one may simply enjoy the physical exertion. Accordingly, the expected benefits of engaging in sports, as in a crafting activity, may differ for these three individuals, depending on whether the activity meets their specific needs. Accordingly, the needs-based model of crafting can capture why people engage in certain behaviors and therefore make more precise predictions of specific crafting outcomes for their energy.

Practical Implications

Our study has three core practical implications for both employees and organizations. First, we show that employees can use crafting as an energy management technique during their working days. Work can leave employees feeling tired and less willing to continue working over the course of the day (Hockey, 2011). Crafting may provide employees with opportunities to change their work routines and make their jobs more enjoyable. In so doing, employees feel less tired and more motivated to continue working. By proactively crafting one's job and work breaks in accordance with psychological needs, employees can sustain higher energy throughout the day, particularly in the morning and afternoon.

Second, our results regarding employees needing time in the morning to reach their peak energy around noon, after which their energy starts again to decrease until bedtime, can assist employees in planning their working days in such manner that they tackle more challenging tasks during their peak energy hours. Awareness of one's daily energy patterns could assist employees in planning their crafting efforts to derive optimal energy benefits from crafting. Yet employees should keep in mind that while crafting can help to sustain higher energy throughout the day, at the end of the day, employees still need high-quality sleep to "charge their batteries" for the next working day.

Third, organizations and leaders can support employees in their crafting efforts by providing them with autonomy to plan their work tasks and work breaks. A work

environment where employees can actively craft their job in accordance with their psychological needs can enhance employees' daily energy, potentially contributing to their long-term health and well-being. However, given the self-regulatory nature of crafting, it is important to ensure that employees' crafting efforts remain autonomously motivated, thereby avoiding external incentives such as rewards for being proactive or enforcing specific break activities (e.g., exercise or mindfulness).

Strengths, Limitations, and Future Research Directions

Despite several strengths such as our experience sampling design with multiple measurements per day across up to four days and rigorous growth curve analyses allowing a detailed investigation of the daily trajectories in crafting and energy, the present study is not without its limitations, and we discuss the four most significant of these.

First, we used self-report measures, which may cause bias due to common method variance (Podsakoff et al., 2003). However, given our focus on the within-person processes over time and interaction effects rather than on bivariate relationships between variables, it is unlikely that our results are heavily affected by common-method bias (Gabriel et al., 2019; Siemsen et al., 2010). Second, in our analyses, we treated day-level crafting efforts as the moderator in the energy trajectory over the course of the day. While these analyses inform us about the relationship between daily crafting efforts and energy trajectories over the course of the day, we cannot rule out reverse causation in the relationship between crafting and energy. While proactivity research proposes that engaging in meaningful and autonomous crafting efforts should be energizing, such proactive behavior also requires employees to have energetic resources that they can direct towards their crafting efforts (Cangiano & Parker, 2015). Hence, people who are already feeling energized may also more easily start crafting (Schmitt et al., 2017). Our study showcases the role of diurnal factors and that simple reciprocal effects are likely masked by other processes. Future experimental studies with an

experimental crafting condition and a control condition would help to shed more light on the temporal order of needs-based crafting and energy and help to further disentangle this "chicken or egg problem" of crafting and energy.

Third, we used a shortened version of the needs-based crafting scale and we did not differentiate between the work and non-work context in our analyses. Using short scales in intense experience sampling designs where people respond to the same items multiple times within a short time period may decrease the response burden and help to avoid measurement contamination (Matthews et al., 2022). Moreover, measuring crafting with a context-free scale provides comprehensive insights into people's needs-based crafting behaviors across the entire day. These insights are especially beneficial for developing an understanding of crafting patterns among people with flexible working arrangements, who may repeatedly switch between their work and private lives throughout the day. However, future research should pay more attention to and disentangle daily needs-based job and off-job crafting behaviors to understand the potential context-dependent differences in people's daily crafting behaviors that this research did not focus on. Our additional analyses may provide some starting points and ideas for this.

Fourth, we treated the six DRAMMA facets as an aggregated crafting construct, not focusing on the potential unique effects of each facet. Research on basic psychological needs satisfaction and recovery experiences supports this approach, showing that employees derive the greatest well-being benefits when reporting balanced needs satisfaction and higher levels of all four recovery experiences (Chawla et al., 2020; Sheldon & Niemiec, 2006). While the effects of the individual DRAMMA facets were not central to this research and were only briefly explored in our additional analyses, we recommend that future research should also explore crafting for each of the six DRAMMA facets in isolation to arrive at a more detailed understanding of the effects of needs-based crafting.

Fifth, while our sample consisted of employees of various ages in various professions and industries in several countries, the majority of our participants were highly educated full-time workers in Germany and the Netherlands, potentially limiting the generalizability of our findings. Employees' crafting efforts across the day may be dependent on their cultural values (Kujanpää et al., 2021) and their work context, potentially inhibiting or encouraging employees' crafting efforts at certain times of the day. Additionally, people's chronotypes (i.e., morningness-eveningness) may affect the timing of their daily peak energy (Kerkhof & Van Dongen, 1996). Future research should therefore explore the role of more stable between-person differences in shaping employees daily crafting and energy patterns.

Sixth, our study protocol of eight daily measurements over four days over the course of two weeks may also have its limitations. By selecting four nonconsecutive days and scheduling the measurement days over a two-week period, we aimed to reduce employees' response burden while still gaining a detailed overview of their typical days. However, this also means that we cannot account for additional variables that may be relevant for next day's energy, such as employees' recovery experiences or needs satisfaction during the previous evening. Future studies on crafting and energy should focus on consecutive days and take these variables into account to gain an even fuller picture of daily crafting and energy trajectories. Future studies should also allow participants to select their personal daily survey schedules to prevent people missing the first or last survey of the day due to a mismatch between their schedule and the survey schedule. Moreover, we used an interval-contingent design, with measurements every two hours (for energy) and every four hours (for crafting) and asked participants to recall their energy and crafting efforts over the past two hours. While this design provides a sophisticated way to investigate change patterns, it may not be completely free from recall bias (Beal & Weiss, 2003). Additionally, measuring crafting only at every other measurement occasion means that not all crafting efforts across the day were

captured. An event-contingent design in which a participant reports every instance of their crafting efforts might provide an even more accurate understanding of when and where crafting happens.

Conclusion

Our study demonstrated that there are biologically determined diurnal cycles in energy leading to an inverted U-shaped energy trajectory. However, we could also show that humans are agentic and to some extent can override this by proactive behaviors aiming to satisfy psychological needs. Using an experience sampling methodology, we showed that crafting can provide employees with energy that "makes them fly higher", especially during the day and lead to steeper energy trajectories across the day. Experimental or intervention research would be particularly useful to arrive at a better, causal understanding of proactive behaviors and feeling energized.

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Figure 1

Experience Sampling Survey Schedule

	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Day 1 Tuesday		**X**		**O**		**X**		**O**		**X**		**O**		**X**		**O**	
Day 2 Saturday			**X**		**O**		**X**		**O**		**X**		**O**		**X**		**O**
Day 3 Wednesday	**X**		**O**		**X**		**O**		**X**		**O**		**X**		**O**		
Day 4 Sunday		**X**		**O**		**X**		**O**		**X**		**O**		**X**		**O**	

Note. **X** marks the measurements where both crafting and energy were measured and **O** marks the measurements where only energy was measured.

Table 1

Means, Standard Deviations, and Zero-order Correlations between Study Variables at Three Levels

	Energy	**Needs-based crafting**
Needs-based crafting		
Level 1 (within-days)	.26***	
Level 2 (between-days)	.28***	
Level 3 (between-persons)	.35***	
M	3.5	3.5
$SD_{\text{Level 1}}$	0.9	0.6
$SD_{\text{Level 2}}$	0.7	0.5
$SD_{\text{Level 3}}$	0.5	0.3

Note. Energy $N_{\text{measurements}}$= 2,358, N_{days}= 396, N_{persons} = 110. Needs-based crafting $N_{\text{measurements}}$= 1,175, N_{days}= 388, N_{persons} = 110.

*** p < .001.

Table 2

Growth Curve Models Predicting Energy over the Course of the Day

	Model 1				Model 2			
Effects	*Est.*	*SE*	*t*	*p*	*Est.*	*SE*	*t*	*p*
Fixed effects								
Intercept	3.66	0.05	72.46	< .001	3.66	0.05	73.60	< .001
Linear time trend	0.01	0.01	0.75	.455	0.00	0.01	0.47	.635
Quadratic time trend	-0.01	0.00	-7.83	< .001	-0.01	0.00	-7.58	< .001
Person-specific crafting					0.49	0.16	3.15	.002
Day-specific crafting					0.57	0.08	7.57	< .001

Effects	Model 1				Model 2			
	Est.	*SE*	*t*	*p*	*Est.*	*SE*	*t*	*p*
Linear time trend x person-specific crafting					-0.00	0.03	-0.11	.915
Quadratic time trend x person-specific crafting					-0.00	0.00	-0.20	.842
Linear time trend x day-specific crafting					0.01	0.02	0.55	.585
Quadratic time trend x day-specific crafting					-0.01	0.00	-2.14	.033
Random effects (person level)								
Intercept	0.430				0.431			
Linear time trend	0.056				0.057			
Quadratic time trend	0.003				0.003			
Random effects (day level)								
Intercept	0.272				0.205			
Linear time trend	0.000				0.000			
Quadratic time trend	0.003				0.003			
Residual	0.723				0.713			
Marginal R^2	0.056				0.098			
Conditional R^2	0.512				0.520			

Note. *N*: Model 1 = 2,358 observations, 396 days, 110 persons; Model 2 = 2,347 observations, 388 days, 110 persons.

Figure 2

Trajectory of Energy over the Course of the Day

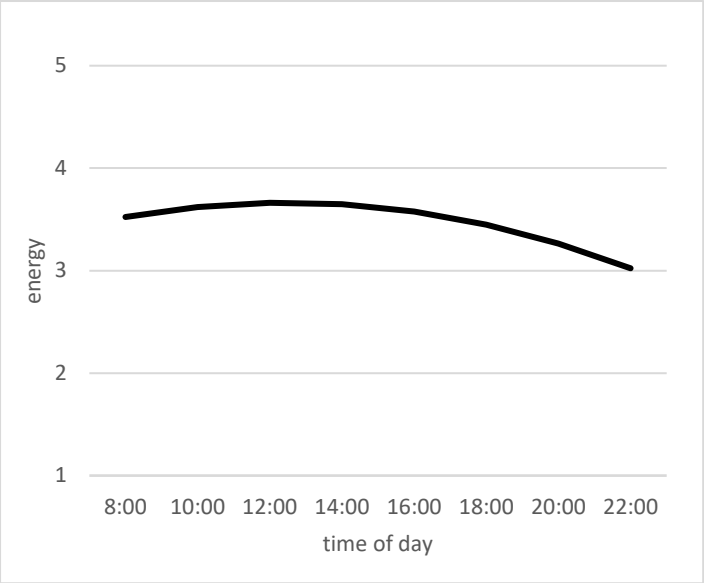

Figure 3

Differential Trajectories of Energy over the Course of the Day as a Function of Daily Needs-based Crafting

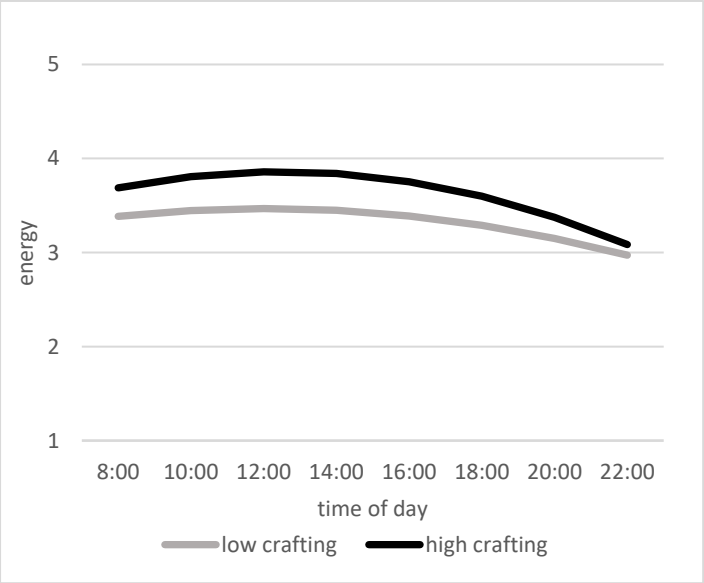

Table 3

Growth Curve Model Predicting Crafting over the Course of the Day

	Model 1				Model 2			
Effects	*Est.*	*SE*	*t*	*p*	*Est.*	*SE*	*t*	*p*
Fixed effects								
Intercept	3.47	0.03	110.09	< .001	3.33	0.04	93.76	< .001
Linear time trend	0.03	0.00	6.54	< .001	0.03	0.01	6.20	< .001
Day					0.32	0.05	7.24	< .001
Linear time trend x Day					-0.02	0.01	-2.49	.013
Random effects (person level)								
Intercept	0.220				0.231			
Linear time trend	0.020				0.021			
Day					0.158			
Random effects (day level)								
Intercept	0.127				0.057			
Linear time trend	0.000				0.000			
Day					0.000			
Residual	0.576				0.553			
Marginal R^2	0.036				0.086			
Conditional R^2	0.214				0.276			

Note. *N*: Model 1 = 1,175 observations, 388 days, 110 persons; Model 2 = 1,175 observations, 388 days, 110 persons.

Figure 4

Trajectory of Needs-based Crafting over the Course of the Day

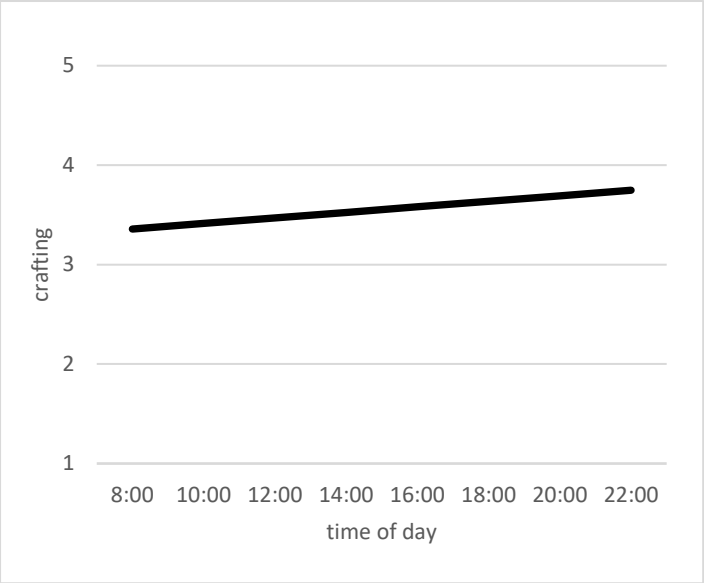

Figure 5

Differential Trajectories of Needs-based Crafting over the Course of Workdays vs. Weekend Days

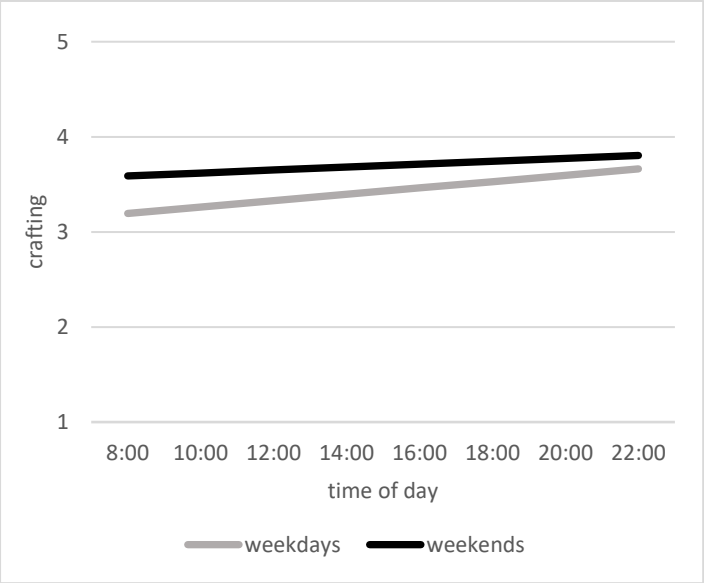

Table S1

Differences in Mean Crafting Scores in Work and Non-Work Context for Each DRAMMA Dimension

	M (SD)		
Variable	Work context	Non-work context	Difference (*t*)
Craft for Detachment	2.90 (1.15)	3.91 (1.01)	t (299.75) = -11.52, p < .001
Craft for Relaxation	2.89 (1.09)	3.92 (0.94)	t (294.29) = -12.74, p < .001
Craft for Autonomy	3.41 (0.95)	3.93 (0.85)	t (470.96) = -8.18, p < .001
Craft for Mastery	3.57 (0.86)	3.10 (0.99)	t (1069) = 6.99, p < .001
Craft for Meaning	3.54 (0.86)	3.46 (0.96)	t (571.51) = 1.28, p = .203
Craft for Affiliation	3.16 (0.96)	3.54 (1.03)	t (1069) = -5.72, p < .001

Notes. N_{work} = 209-290. $N_{non\text{-}work}$ = 781.

Figure S1

Differences in Mean Crafting Scores in Work and Non-Work Context for Each DRAMMA Dimension

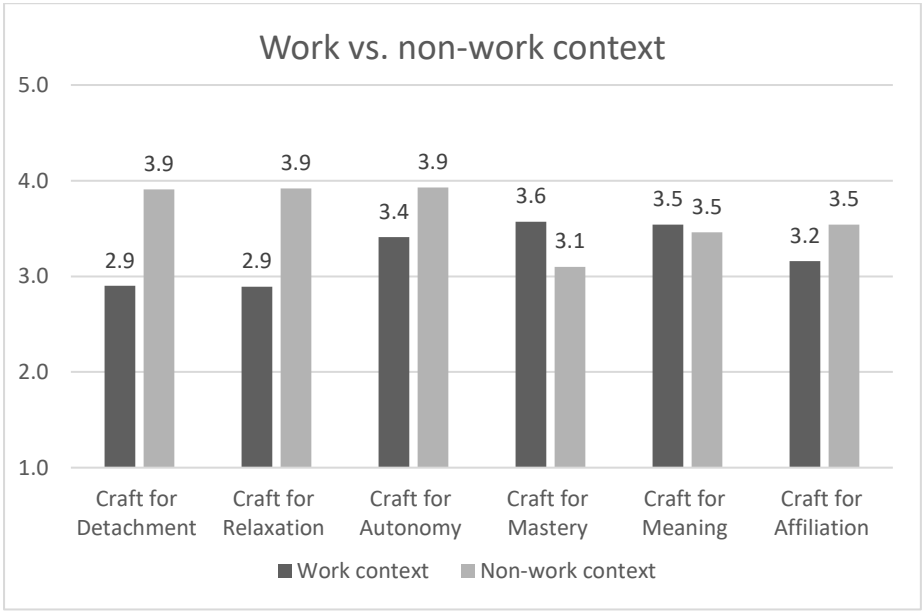

Table S2

Mean Crafting Scores for Each DRAMMA Dimension on High and Low Crafting Days

	M (SD)		Mean Difference (Rank)
Variable	Low crafting day	High crafting day	
Craft for Detachment	3.25 (0.84)	3.98 (0.71)	-0.73 (2-4)
Craft for Relaxation	3.28 (0.81)	3.99 (0.59)	-0.71 (5)
Craft for Autonomy	3.40 (0.65)	4.15 (0.43)	-0.75 (1)
Craft for Mastery	2.89 (0.70)	3.62 (0.53)	-0.73 (2-4)
Craft for Meaning	3.17 (0.67)	3.78 (0.48)	-0.61 (6)
Craft for Affiliation	3.06 (0.74)	3.79 (0.61)	-0.73 (2-4)

Notes. N_{low} = 186-188. N_{high} = 198-200.

Figure S2

Mean Crafting Scores for Each DRAMMA Dimension on High and Low Crafting Days