# FAST OR SLOW: HOW TEMPORAL WORK DESIGN SHAPES EXPERIENCED PASSAGE OF TIME AND JOB PERFORMANCE

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**ABSTRACT**

Experienced passage of time, the extent to which employees perceive the passage of work time as being fast or slow, is a fundamental aspect of work experience. We identify two novel temporal work design characteristics that can speed up employees' experienced passage of time: temporal predictability and task segmentation. Jobs with high temporal predictability do not make employees go through uncertain wait times before embarking on their next task. High task segmentation occurs when a large chunk of work time is segmented by categorically different temporal markers. We tested a model in which temporal predictability and task segmentation affect experienced passage of time, which in turn influences job performance, with five studies: two experiments that established the internal validity of temporal predictability and task segmentation (Studies 1a and 1b), a naturalistic field study in a factory that investigated the natural consequences of distinct temporal work design (Study 2), an organizational field study that constructively replicated the model using a sample of knowledge workers and their supervisors (Study 3), and an online survey in which we connected our model with the broader work design literature (Study 4). Altogether, the studies support a new temporal approach to work design.



*Keywords:* work design, temporal predictability, task segmentation, experienced passage of time, performance

We all experience the passage of time, whether it is fast or slow. We transform linear, objective, and quantifiable clock time into interpretive, heterogeneous, and subjective perceptions of time (Ancona, Okhuysen, & Perlow, 2001; Shipp & Cole, 2015). A meaningful life is based not on clock time but on subjective time (Hale, 1993). As the famous quote by Albert Einstein goes, "Put your hand on a hot stove for a minute, and it seems like an hour. Sit with a pretty girl for an hour, and it seems like a minute" (The New York Times, 1929: 3). Similarly, people have reported that time seems to speed up when they listen to certain types of music, slow down during life-threatening situations, and shift in various ways when they take certain drugs (Kellaris & Kent, 1992; Stetson, Fiesta, & Eagleman, 2007; Wittmann et al., 2007). In all these situations, clock time does not change, but people's subjective experience of time does.

In work contexts, the typical 8-hour workday can pass quickly for some yet drag for others. Individuals tend to rate the fast passage of time as productive and pleasant but perceive the slow passage of time as counterproductive and aversive (Holloway, Smith, & Warren, 1998; Sackett, Meyvis, Nelson, Converse, & Sackett, 2010; Stanghellini et al., 2017; Vogel, Krämer, Schoofs, Kupke, & Vogeley, 2018). However, workers' experienced passage of time is a critical work experience that is not well understood in the management literature. In this paper, we seek to understand the following questions: Is it possible to alter employees' experienced passage of time via work design, and, if possible, are there any performance benefits of doing so?

In this paper, we draw on the attentional gate model (Zakay & Block, 1995) to propose a novel approach that focuses specifically on designing work for faster time experience. According to this theory, the degree to which individuals have a fast-flowing time experience is determined by the amount of attention allocated to temporal cues. When people "watch a pot until it boils," time seems to pass slowly because attention is devoted to the passage of time. On the other hand, when people immerse themselves in nontemporal aspects of the environment, time seems to pass quickly because they have no cognitive capacity to process the passage of time (Brown, 2008; Zakay, 1989). Based on this reasoning, we conceptualize two temporal work characteristics that directly shape employees' experienced passage of time: temporal predictability (the extent to which a job minimizes unpredictable waiting periods before a task or event) and task segmentation (the extent to which a large chunk of time at work is divided into several smaller blocks by temporal markers with a distinguishable nature). As will be theorized in detail later, these work characteristics directly shift employees' attention away from temporal cues and thereby speed up their experienced passage of time at work. We further argue that, as a positive work experience, the faster passage of time experienced by employees gives rise to better job performance. The focus of the existing work design literature is designing work for positive motivational states, such as enhanced meaningfulness, responsibility, and psychological empowerment, by making the job more intrinsically motivating (see Humphrey, Nahrgang, & Morgeson, 2007; Parker, Morgeson, & Johns, 2017). As such, the study of these two new temporal work design characteristics offers a new attention-based vehicle for improving people's work experiences and outcomes.

Our research makes several important contributions. First, we contribute to the work design literature by identifying two novel temporal work design characteristics: temporal predictability and task segmentation. They improve employees' work experiences and outcomes like other established work characteristics yet are relatively easier to implement than the design of work content (Elsbach & Hargadon, 2006). Because of the universality of time experience, it is applicable to a wider range of jobs, including those simple and structured jobs that are difficult to improve by traditional work design (Menges, Tussing, Wihler, & Grant, 2017). This new approach adds a novel, viable option to work design.

Second, we investigate a universal yet understudied work experience—time passing quickly or slowly at work. The prior work design literature has covered a wide range of work experiences as intermediate outcomes of work design, such as the extent to which employees feel energized, stressed, or meaningful at work, and has examined these experiences as drivers of job performance (Parker, 2014). Experienced passage of time has not been considered as an intermediate outcome of work design nor as an explanation of why work design might improve performance. A better understanding of experienced passage of time offers a new direction for work design and performance improvement efforts.

A further contribution is that this research informs an emerging research program in management research: the time literature. To the best of our knowledge, the time literature within the management field has not yet systematically studied how employees experience work time differently and how such variations influence work outcomes (Shipp & Cole, 2015). Given that experienced passage of time is an important work experience in and of itself, it is critical and relevant to study how and why some employees perceive time to pass more quickly than others. In this paper, we develop and test a model of experienced passage of time, addressing questions regarding its situational antecedents and workplace outcomes.

## THEORY AND HYPOTHESES DEVELOPMENT

Work design is an important research stream in the field of management. Work design theories focus on how the nature and the organization of workers' tasks, activities, and responsibilities can create positive work experiences (or reduce negative work experiences) and thereby affect key outcomes, such as job satisfaction and job performance (Parker, 2014). Frequently, the path to improving work experiences has been through enhancing the core work characteristics identified in the Job Characteristics Model (Hackman & Oldham, 1976) and its extensions (Grant & Parker, 2009; Humphrey et al., 2007; Parker et al., 2017), such as task variety, job autonomy, task significance, task identity, and feedback. Considerable evidence shows that these work characteristics do indeed enhance important aspects of employees' work experience, such as the extent to which employees feel a sense of ownership (e.g., Pierce, Jussila, & Cummings, 2009) and see work as meaningful (e.g., Tims, Derks, & Bakker, 2016). Beyond these core work characteristics, scholars have also focused on work characteristics that cause psychological strain (e.g., job demands; Karasek, 1979) and relational work characteristics that promote employees' sense of social connection (e.g., contact with beneficiaries of the work; Grant, 2007).

In recent years, time has begun to be incorporated into work design theories (Parker, Andrei, & Li, 2014). Some notable areas of research in this respect include flexible scheduling (the degree to which employees can decide their work/break time by themselves; Spreitzer, Cameron, & Garrett, 2017), temporal virtuality (individuals from the same team or the same project working asynchronously in different time zones; Cummings, Espinosa, & Pickering, 2009), and time pressure (the speed at which work must be completed; Ohly & Fritz, 2010). Although these work characteristics are temporal in nature, they are not attention-based. Yet, there are important reasons to use temporal work design to make employees stay focused and stay productive. In this paper, we add to work design theory by using temporal work design (i.e., temporal predictability and task segmentation) to improve a fundamental aspect of work experience that is still under-researched—one's experience of the passage of time as being fast or slow.

Although it is still new to the management literature, it has long been recognized elsewhere that the speed at which subjective time flows is an important psychological experience worthy of empirical attention (Conti, 2001). The fast passage of time is a more desirable experience than the slow passage of time (Droit-Volet, 2009). The flow of time carries an inner hedonic nature, such that individuals tend to attribute the fast passage of time to something positive about their tasks (Sackett et al., 2010). Experiencing time passing slowly, on the other hand, is an aversive experience. For example, Danckert and Allman (2005) found that when individuals experience the slow passage of time, they are more likely to report boredom and exhaustion. The perception of time passing quickly has also been implicated in goal pursuit because when people experience time as passing more quickly than it really is, they are more likely to persist in goal-oriented behaviors. On the other hand, when time goes slowly, individuals are more likely to disengage from goal pursuit (Gable & Poole, 2012).

We draw from Zakay and Block's (1995) attentional gate model to investigate why time seems to flow faster for some people than for others at work. The attentional gate model is an influential framework in the field of cognitive science; it directly answers the question as to why the perception of the passage of time varies from individual to individual. The main idea of the attentional gate model is that a gate is responsible for individuals' judgment of time. The gate is a cognitive mechanism that can be activated by arousal from the external environment. When more attention is allocated to time, the gate opens wider, and the subjective experience of time slows down. Pulses emitted by an individual's internal pacemaker pass through the attentional gate, and those pulses accumulate to form a time judgment. Subjective time is longer when the attentional gate is wider and shorter when it is narrower or even closed (Matthews & Meck, 2016).

We propose that the temporal work characteristics of temporal predictability and task segmentation will direct employees' attention away from temporal cues and thereby speed up employees' experienced passage of time. The attentional gate model suggests that temporal information and nontemporal information compete for the same neurological function in the brain (Zakay & Block, 1995). When employees' attention is allocated to nontemporal information, they cannot process temporal information. This results in a faster passage of time (and vice versa). We next offer specific arguments about the role of temporal predictability and task segmentation in this process.

**Temporal predictability**

Temporal predictability is concerned with the degree to which a job cuts down an uncertain “fore-period” or “empty” period preceding a task or an event (Grondin & Rammsayer, 2003). When temporal predictability is high, a job does not have or has a low level of unpredictable waiting periods. Low temporal predictability means that individuals have conscious expectations about the start time of a task or an event. More specifically, a lack of temporal predictability means that when one knows something will happen but does not know exactly when. Such a situation creates uncertainty and expectancy (Grondin & Rammsayer, 2003). When the fore-period is uncertain, individual attention is drawn to time (Boltz, 1993; Brown, 2008), and their attentional vigilance to time is higher (Vangkilde, Petersen, & Bundesen, 2013).

In terms of the attentional gate model, the uncertain fore-period widens the gate, allowing more pulses to pass through the gate and creating a lengthy subjective time judgment. For example, Cahoon and Edmonds (1980) tested the “watched pot never boils” phenomenon and found that their experimental group, which was told to signal when the water began to boil, made significantly longer time estimations for the same time interval than the control group who did not receive such instructions. The instructions in the experimental group created a sense of “waiting for something,” heightening the group’s temporal attention and slowing down their perception of time. Marketing researchers have shown that leveraging nontemporal activities (e.g., listening to music) and presenting temporal certainty (e.g., telling customers how long they will have to wait) can distract customers’ attention away from their time in a queue and reduce their active anticipation, which in turn effectively reduces their subjective wait time and increases service evaluations (Chebat, Gelinas-Chebat, & Filiatrault, 1993; Hui & Tse, 1996). In a similar vein, in a study of passengers' perception of wait time at bus stops, Mishalani, McCord, and Wirtz (2006) found that if passengers are given an exact time schedule, it helps to reduce their perception of how long they have waited. Such strategies all increase temporal predictability because they remove the wait time for an event, fill up the empty period before the event, or make the wait time more predictable.

Altogether, based on the attentional gate model, we predict that work design with high temporal predictability will divert individuals from monitoring the passage of time and dampen their temporal awareness, thereby shrinking subjective time and resulting in faster experienced passage of time (Zakay & Block, 1995). In contrast, low temporal predictability, such as in the "watched pot" phenomenon, makes individuals spend a substantial amount of time waiting for uncertain future events to happen, thereby prompting them to pay attention to time and causing them to perceive time as passing slowly (Barnes & Jones, 2000; Sanders, 1998; Schiff & Thayer, 1968; Tse, Intriligator, Rivest, & Cavanagh, 2004). We thus predict the following:

*Hypothesis 1*: Temporal predictability is positively associated with experienced passage of time.

**Task segmentation**

Task segmentation is concerned with dividing a large chunk of time into several smaller blocks by using temporal markers that are distinguishable from the primary task. The primary task and the temporal marker should be different in nature. It is a characteristic of the human brain that people need new stimuli to stay focused for an extended period of time (Ariga & Llera, 2011; MacLean et al., 2009). When individual attention on the primary task starts to diminish (which is inevitable), switching to a different task at this stage can help the person restore the level of focused attention to the primary task (Ariga & Llera, 2011; MacLean et al., 2009).

More specifically, we know from cognitive science research that individuals have a limited span of focused attention (Smallwood & Schooler, 2006). Attention span varies from person to person and from activity to activity. It can be negatively affected by many factors, such as a lack of interest, negative emotions, and low energy levels (Zahariades, 2017). In the phenomenon known as vigilance decrement (Davis & Parasuraman, 1982; McVay, Kane, & Kwapil, 2009; Randall, Oswald, & Beier, 2014), as people spend more time on a task, their executive control shifts away from the focal task to something else. As attention theories explain it (e.g., Eagleman & Pariyadath, 2009; Walsh, 2003; Zakay & Block, 1995), a drop in vigilance in a focal task increases the vigilance about time because additional attentional capacities are made available for the latter. In other words, as people lose focus on the primary task via a vigilance decrement, they pay more attention to temporal cues that widen the "gate" of time processing, leading to heightened time awareness and a prolonged experience of time. Such a shift in attention is often involuntary, and individuals may not even be aware when it happens (Randall et al., 2014). Cognitive researchers have identified remedies for the vigilance decrement problem, such as imposing exogenous attentional cues and switching the person to a different type of activity (Ariga & Llera, 2011; MacLean et al., 2009). In work settings, it should be beneficial to segment a primary task with temporal markers to account for people's tendency to lose focus over time. Temporal markers can take various forms as long as they are different in nature from the primary task. Such "boosters" can further sustain individuals' attention for a longer period of time to prevent attention from drifting toward time.

It is noteworthy that among a few management studies that have touched on the concept of task switching (which is related to, but different from, task segmentation), frequent task switching is typically viewed as a disruptive rather than an enabling feature. For example, Leroy (2009) argues that frequent task switching is detrimental to one's performance because it creates an “attention residue” when a person is forced to take himself/herself away from an absorbing task and switch to a different task. However, task segmentation we are interested in here follows an important scientific principle—temporal markers should be introduced when attention to the primary task starts to diminish. It thus should produce a positive rather than a negative effect.

Task segmentation can be socially constructed, self-initiated, or externally imposed. For example, the well-known “banana time” descriptive study conducted by Roy (1959) provides an example of how socially constructed task segmentation works. Roy describes how workers in a machine shop used playful temporal markers to make their monotonous work activities more tolerable. They took refreshment breaks together and gave those breaks such names as “banana time,” “peach time,” “window time,” and “pickup time.” The temporal markers used to segment time in that context were social and entertaining. They were categorically different from the workers’ primary task of machine operation.

Elsbach and Hargadon’s (2006) idea of inserting “mindless work” between cognitively challenging tasks conducted by overworked professionals represents an example of self-initiated task segmentation. Mindless work includes tasks that are cognitively easy with little performance pressure, such as making photocopies, cleaning one’s desk, and stocking supplies. These tasks are distinct from professionals’ primary tasks (e.g., practicing law) and, as such, serve as temporal markers to segment professionals’ workdays.

An example of externally imposed task segmentation is Perlow’s (1999) time famine study, which was conducted in a software development company. The software engineers involved often found they had too much to do but too little time. A formal company policy was introduced to divide work time into “quiet time” and “talk time.” Engineers were not allowed to talk to each other, make phone calls, or hold meetings during quiet time. Although the study was not interested in task segmentation per se, we can infer from the improved work outcomes in the company that the engineers were more focused because of the externally imposed task segmentation. All these practices prevented attention from drifting toward temporal cues in the environment that would prolong their subjective time experience.

In sum, we predict that with task segmentation, employees will have fewer cognitive capacities available for dwelling on time and therefore fostering the sense that time is passing more quickly. We propose the following hypothesis:

*Hypothesis 2*: Task segmentation is positively associated with experienced passage of time.

**Experienced Passage of Time and Job Performance**

In the work design literature, work experiences are theorized to be intermediate outcomes that drive ultimate outcomes such as job performance (e.g., Pierce et al., 2009; Tims et al., 2016). Here, we argue that employees with a fast-flowing experience of time tend to perform their jobs more effectively and therefore that temporal predictability and task segmentation improve job performance via the experience of time passing faster.

According to Conti (2001: 3), “the subjective experience of time awareness is a central aspect of motivational experience.” A fast-flowing time experience is a pleasant experience conducive to good performance. In multiple controlled experiments, Sackett et al. (2010) found that when participants perceived time to be passing quickly, they tended to rate (a) their tasks (e.g., neutral information-processing tasks) as more engaging and (b) annoying environmental hazards (e.g., noises) as more tolerable and less irritating. The feeling that time is moving quickly and painlessly allows employees to infer positive qualities about their job and thus to perform better. On the other hand, it is a human instinct to dread the experience of time passing slowly; almost everybody finds “killing time” unpleasant (Levine, 1997). For example, James (1892), arguably the first theorist to discuss the awareness of time, used negative terms, such as “odious” and “insipid,” to describe the slow passage of time. When employees perceive that their workdays pass slowly, they may make negative attributions about their job and experience an unfulfilled desire to engage in more satisfying activities, thereby falling victim to negative affect and low morale. Consequently, their job performance may suffer (Danckert & Allman, 2005; Fisher, 1993; Fredrickson & Joiner, 2002; Smith, 1981). Attesting to this idea from a different angle, Gable and Poole (2012: 880) argued that "a perceived shortening in the passing of time … may prolong tenacious goal pursuit" and that "perceptions of time passing more slowly … could hinder goal pursuit or cause goals to be evaluated as less desirable." In short, the above reasoning suggests that individuals' experience of the faster passage of time is associated with less aversive components, such as insipidity, boredom, or exhaustion, and inspires more persistent goal pursuit. As a result, a job with a fast-flowing time experience is expected to be a productive one.

When temporal predictability and task segmentation are incorporated into work design, employees do not feel the need to pay attention to temporal cues, and thus they are more likely to be absorbed in their tasks and to experience time passing by more quickly (Zakay & Block, 1995); on the other hand, when their attention is directed to temporal cues, they tend to perceive time as passing slowly. These designs are expected to speed up the passage of time for employees, which in turn leads to better job performance. Thus, we hypothesize the following:

> *Hypothesis 3*: Experienced passage of time mediates the effect of temporal predictability on job performance.
>
> *Hypothesis 4*: Experienced passage of time mediates the effect of task segmentation on job performance.

We tested our hypotheses with five research studies using different methods. To establish the internal validity of the research model, we conducted two experiments, Study 1a and Study 1b, using the same objective task for both the experimental group and the control group. Study 2 was a naturalistic field study in a factory setting that naturally reflected the temporal design features of interest. We explored time experience and job performance resulting from these work arrangements in this context. We then conducted an organizational field study, Study 3, based on a sample of knowledge workers to further extend the external validity and generalizability of our model. Study 4 was an online survey based on working adults recruited from Amazon's crowdsourcing marketplace, Mechanical Turk (MTurk); this study was designed to show how our new temporal work characteristics and explanatory mechanism go above and beyond the existing ones in the work design literature.

## STUDY 1: EXPERIMENTS

In Study 1, we conducted two between-subject experiments. Study 1a manipulated temporal predictability, and Study 1b manipulated task segmentation. Consistent with similar methods in literature (Wan, Chan, & Chen, 2016), we used two experiments (rather than a combined factorial design) because we did not expect temporal predictability to interact with task segmentation. We recruited participants from MTurk. In both experiments, to increase experimental realism (Colquitt, 2008), the MTurk participants were told that they were being invited to check other MTurkers' calculations and typos.

### Study 1a: Temporal predictability

A total of 116 American working adults were recruited from MTurk to participate in a one-factor between-subject experiment in exchange for a small monetary incentive. As theorized above, temporal predictability captures how much a job saves workers from waiting for an uncertain amount of time for something that is likely to happen in the future. The participants were randomly assigned to either the experimental condition (i.e., high temporal predictability) or the control condition (i.e., low temporal predictability). In both conditions, the participants completed three calculation checking tasks, each of which lasted for 5.5

minutes. The participants were given correct or incorrect equations (e.g., 59 + 84 = 143 or 82 + 58 = 150) and were asked to indicate whether the answer from another MTurker was correct or incorrect. There was a 20-second break between the first and second calculation checking tasks and a 30-second break between the second and third tasks. The last task was followed by a 40-second break. Participants in both conditions experienced the exact same task sequence and task length.

At the beginning of the task, we informed participants in both conditions that the overall study time was 16.5 minutes to ensure that perceived time pressure did not differ between the two groups. To manipulate temporal predictability, participants in the experimental condition were presented with a clear schedule of task time and break time. In contrast, those in the control condition did not know how long it would take for each task and each break, and they kept waiting until they were instructed to move on. We thus created high temporal predictability in the experimental condition and low temporal predictability in the control condition. The degree of task segmentation, however, was the same across both conditions (as were other work characteristics, such as job autonomy and job variety).

***Measures***. Participants from both conditions reported their experienced passage of time when they were about two thirds of the way through the study time. This helped to establish the temporal precedence of experienced passage of time over task performance. Experienced passage of time was self-reported on a five-point scale (1 = strongly disagree; 5 = strongly agree) using four items adapted from Agarwal and Karahanna (2000): “Study time appears to go by quickly,” “Time flies when I work on the study,” “I lose track of time during the study,” and “The study time appears to be shorter than it really is.” Agarwal and Karahanna originally developed their scale to understand people’s experienced passage of time while surfing the Internet, so we only included relevant items and modified them for the context of our study ($\alpha$ = .83). We used the number of correct answers in the calculation checking tasks to measure the participants' task performance in this study. To verify whether time pressure differed across conditions, we asked participants to indicate, using a five-point scale (1 = not at all; 5 = very much), the extent to which they felt the time pressure during the calculation checking tasks.

***Manipulation check.*** We used four items to measure temporal predictability on a five-point scale (1 = strongly disagree; 5 = strongly agree) for a manipulation check. These items were developed for this study. We invited several experts in motivation and time research to check their face validity (Hinkin, 1998). The four items were as follows: (1) "This study requires me to spend a substantial portion of time waiting for unpredictable tasks [R]"; (2) "I often find myself waiting for the next piece of work, which could happen at any time [R]"; (3) "In this study, I am often on 'standby,' waiting for a task to occur at some unknown time [R]"; and (4) "My work involves lots of waiting for something to happen at some unspecified time [R]" ($\alpha$ =.89, reversed-coded). The results showed that participants in the experimental condition (high temporal predictability) perceived significantly higher temporal predictability ($M$ = 2.78) than those in the control condition (low temporal predictability) ($M$ = 2.36, $F$ (1, 114) = 5.57, $p$ = .02, $\eta^2$ = .05). This result confirmed that our manipulation of temporal predictability was successful.

***Study findings.*** Table 1 presents the descriptive statistics. We tested Hypothesis 1 and Hypothesis 3 in this experiment. Hypothesis 1 proposed that temporal predictability is positively associated with experienced passage of time. We conducted a one-way analysis of variance (ANOVA) and found a significant main effect of temporal predictability on experienced passage of time ($F$ (1, 114) = 5.14, $p$ = .03, $\eta^2$ = .04). Compared with participants in the control condition (low temporal predictability: $M$ = 3.63), participants in the experimental condition (high temporal predictability: $M$ = 3.94) perceived time as passing significantly faster. Hypothesis 1 was therefore supported.

Hypothesis 3 proposed a mediation effect of temporal predictability on task performance via experienced passage of time. For this hypothesis, we conducted a bootstrapping analysis using Mplus 8.0. The 95% confidence interval (CI) for the indirect effect suggested that the effect of temporal predictability on performance was mediated by experienced passage of time (indirect effect = 14.83, 95% CI = [2.83, 29.43]). Thus, Hypothesis 3 was supported. To further understand how the experimental condition differed from the control condition, we conducted a supplementary one-way ANOVA on task performance. We found a significant main effect of temporal predictability on performance ($F$ (1, 114) = 24.41, $p$ = .00, $\eta^2$ = .18), with participants in the experimental condition (high temporal predictability: $M$ = 219.09) provided more correct answers than those in the control condition (low temporal predictability: $M$ = 144.90). Analysis of the perceived time pressure across conditions showed that participants' time pressure in the experimental condition ($M$ = 3.86) did not differ from that in the control condition ($M$ = 3.81; $F$ < 1), which suggests that time pressure did not drive the effect.

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**Study 1b: Task segmentation**

In Study 1b, we followed the same procedure as in Study 1a and recruited 118 American participants from MTurk. None of the participants in Study 1b had participated in Study 1a. Task segmentation captures whether a large chunk of time is segmented into distinguishable smaller blocks by temporal markers of a different nature. We used the same calculation checking tasks as in Study 1a for the focal tasks. Because typo checking is categorically different from calculation checking, we used typo checking tasks as temporal markers. The typo checking tasks required the participants to correct wrong typing into correct words (e.g., dlophni → dolphin; kaybeord → keyboard). Again, participants were randomly assigned to either the experimental condition (i.e., high task segmentation) or the control condition (i.e., low task segmentation). In both conditions, participants were asked to complete three calculation checking tasks, each lasting 5.5 minutes, and three typo checking tasks, each lasting 3 minutes.[1] In the experimental condition, the calculation checking tasks and typo checking tasks were arranged in an alternate mode. A 5.5-minute calculation checking task appeared first, followed by a 3-minute typo checking task, then another calculation checking task and another typo checking task, and so on. By doing this, the focal calculation checking task was segmented by a typo checking task that served as a temporal marker in this context. In contrast, in the control condition, participants were asked to first complete all three calculation checking tasks together and then to finish all three typo checking tasks after that. There was no break in either group. By doing this, we created high task segmentation in the experimental condition and low task segmentation in the control condition, with all other aspects being equal.

***Measures.*** Experienced passage of time was measured using the same scale as in Study 1a ($\alpha$ = .84). Performance was measured using the number of correct questions for the calculation checking tasks. We also measured perceived time pressure and perceived task variety to check whether or not they differed across conditions.

***Manipulation check.*** Following the same procedures for temporal predictability, we also developed four items to measure task segmentation as a manipulation check (Hinkin,

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[1] The effect of task segmentation is based on the scientific principle that an individual's focused attention is limited and may drop over time (Smallwood & Schooler, 2006). Our theory is that temporal markers help restore a person's diminishing attention on focal tasks and prevent it from drifting toward time processing, so we needed to know how long it took for individuals to naturally switch their attention away from their focal tasks. We therefore conducted a pilot study to determine the appropriate duration for the focal tasks and temporal markers prior to the experiment. In the pilot, we recruited a different group of 50 MTurk participants and asked them to keep working on the calculation checking until they felt that they could no longer stay focused. We then did the same for the task that involved correcting typos. We calculated the average time it took for these participants to report that they had lost their focused attention. As a result of the pilot study, we gained a better understanding of how long the average research participant could stay focused on the given tasks in our given performance context. The average time at which participants reported losing focus for the calculation checking task was 231 seconds, and the standard deviation was 34. The average time for the typo checking task was 117 seconds, and the standard deviation was 22. After adding 3 SD to the means, we used 5.5 minutes as the duration for each calculation checking task and 3 minutes for each typo checking task in the main experiments.

1998). These four items are (1 = strongly disagree; 5 = strongly agree): (1) “The whole study was broken down to be performed in different blocks of time”; (2) “In the study, I carried out my work in small chunks of time”; (3) In the study, the time was separated into smaller segments by clear ‘markers’”; (4) “The study provided opportunities to separate a long task into smaller chunks with a different activity in between.” The reliability score of this scale was.72. The results confirmed that the participants in the experimental condition perceived time to be more segmented ($M$ = 3.78) than those in the control condition did ($M$ = 3.31, $F$ (1, 116) = 6.73; $p$ = .01, $\eta^2$ = .06), indicating that the manipulation of task segmentation was successful.

***Study findings.*** Table 2 presents the descriptive statistics. Hypothesis 2 proposed that task segmentation is positively associated with experienced passage of time. A one-way ANOVA revealed that task segmentation had a significant main effect on the participants’ experienced passage of time ($F$(1, 116) = 7.17, $p$ = .01, $\eta^2$ = .06). Compared with the participants in the control condition (low task segmentation: $M$ = 3.52), the participants in the experimental condition (high task segmentation: $M$ = 3.93) perceived the time as going by faster. Hypothesis 2 was therefore supported.

Hypothesis 4 proposed that task segmentation exerts a mediation effect on task performance via experienced passage of time. We again used bootstrapping in Mplus 8.0 to test this hypothesis. The 95% CI for the indirect effect suggested that the effect of task segmentation on performance was mediated by experienced passage of time (indirect effect = 10.60, 95% CI = [2.02, 23.78]). Thus, Hypothesis 4 was supported. We further compared the levels of task performance in the experimental condition and the control condition. We conducted a one-way ANOVA and found that task segmentation exerted a significant main effect on overall performance ($F$ (1, 116) = 24.60, $p$ = .00, $\eta^2$ = .18). Participants in the experimental condition (high task segmentation: $M$ = 220.83) completed more questions correctly than those in the control condition did (low task segmentation: *M* = 151.25). This finding is consistent with our theory that task segmentation is expected to increase task performance. An analysis of the perceived time pressure across conditions showed that participants' time pressure in the experimental condition (*M* = 3.75) did not differ from that in the control condition (*M* = 3.78; *F* < 1). Participants' perceived task variety also did not differ across the experimental condition (*M* = 3.90) and the control condition (*M* = 3.93; *F* < 1). The results suggest that these variables did not drive the observed effect.

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Insert Table 2 about here
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## STUDY 2: NATURALISTIC FIELD STUDY

### Research Context

We next tested our idea in a unique field setting with natural variations in employees' work characteristics regarding temporal predictability and task segmentation (for similar approaches, see Champoux, 1978; Morrison & Clements, 1997; Wall, Jackson, & Davids, 1992). We found a large Chinese garment factory with two interesting types of workers. Sewing machinists in the factory worked on an open floor organized into different automatic assembly lines of sewing machines. Each floor had a workstation with several support workers available to give dedicated support to the floor. Support workers were on standby in their workstations throughout the day. They were called on for support when a needle needed to be changed, a garment was contaminated, or a miscellaneous task needed to be performed. Sewing machinists and support workers had the same work schedule, worked in the same environment, followed the same rules and regulations, reported to the same floor supervisors, and conducted simple and repetitive tasks with little autonomy. There were also some notable differences according to our observations and information provided by managers of the factory. Sewing machinists had very short or almost no wait times for new tasks. The assembly lines were automatic, and they could tell exactly when the next piece of garment would come up to their operator. In contrast, support workers spent a substantial portion of their workday waiting for a call for support. They were not allowed to leave their workstations while waiting for calls. They knew they would be called, but they could not predict exactly when. Sewing machinists also had several regular and externally enforced periods of disengagement from their work, including three garment quality checks and two machine station checks. The checks were administered by an independent quality insurance team in the factor. In contrast, there were no regular checks for support workers.

**Research Procedures**

The factory had more than 2000 workers. Only 46 of them worked in the support function; this personnel proportion is standard in this industry. With the help of the factory's human resources (HR) department, we invited all 46 support employees to participate in our study. Among all the sewing machinists in the factory, we used a stratified random sampling approach to find a matched sample of 60 sewing machinists. This stratified random sampling approach ensured that the population of sewing machinists had demographic characteristics similar to those of the support workers.

Research assistants visited the conference hall of the factory to greet participants; explain the purpose of the study; assure them of the voluntary nature of their participation, the confidentiality of their responses, and their anonymity; address any questions; and then collect the completed questionnaires. The final sample included 96 employees (43 support workers and 53 sewing machinists), representing response rates of 93% and 88%, respectively. Overall, 55% of the participants were men, the average age was 29 years, and the average job tenure was 4.2 years.

**Measures**

***Temporal predictability and task segmentation.*** Temporal predictability and task segmentation were measured by the same items as in the manipulation checks in Study 1a and Study 1b (except that we modified them for the job context). The four modified items for temporal predictability were: (1) “In my typical work time, I spend a substantial portion of my day waiting for unpredictable events or tasks [R]”; (2) “I often find myself waiting for the next piece of work, which could happen at any time [R]”; (3) “In my job, I am often on ‘stand by’, waiting for a task to occur at some unknown time [R]”; and (4) “My workday involves lots of waiting for something to happen at some non-specified time [R].” The four modified items for task segmentation were (1) “My daily work activities can be broken down to be performed in different blocks of time”; (2) “In my job, I carry out my work in small chunks of time”; (3) In my job, a workday is separated into smaller segments by clear ‘markers’”; (4) “My job provides opportunities to separate a long task into smaller chunks with a different activity in between.” The reliability scores were .85 and .81, respectively.

***Experienced passage of time.*** Experienced passage of time was the same measure as in Study 1a and Study 1b but with minor modifications in wording: “Work time appears to go by quickly”; “Time flies when I am at work”; “I lose track of time when I am at work”; and “The workday appears to be shorter than it really is” ($\alpha = .92$).

***Job Performance.*** We used objective performance data from the factory’s archival record, released one month after our survey data collection, to measure job performance. Ratings ranged from one star to five stars and measured multiple aspects of a worker’s work quality.

**Analysis and Results**

Table 3 presents the descriptive statistics and variable correlations.

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Insert Tables 3 and 4 about here
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Prior to the main analyses, we performed several preliminary analyses. First, we conducted a confirmatory factor analysis (CFA) using MLM for the three latent variables in Mplus 8.0: temporal predictability, task segmentation, and experienced passage of time. The measurement model demonstrated a good fit ($\chi^2(51) = 87.95$; confirmatory fit index [CFI] = .93; root mean square error of approximation [RMSEA] = .09; and standardized root mean residual [SRMR] = .07). Exploratory analysis showed that the sewing machinists and the support workers differed in terms of temporal predictability ($F(1, 94) = 7.80$; $p = .006$) and task segmentation ($F(1, 94) = 3.50$; $p = .06$).

We then proceeded with the main analyses for hypotheses testing (see Table 4). We found that both temporal predictability ($B = .30$; $p = .03$) and task segmentation ($B = .22$; $p = .08$) were associated with experienced passage of time. Using bootstrapping analysis, the indirect effect of temporal predictability was statistically significant (indirect effect = .10, 95% CI = [.001, .29]), and the indirect effect of task segmentation was also significant (indirect effect = .07, 95% CI = [.000, .26]). As a result, Hypotheses 1, 3, and 4 were supported, and Hypothesis 2 was marginally supported.[2]

## STUDY 3: A FIELD STUDY OF KNOWLEDGE WORKERS

Study 3 was conducted in the Shanghai branch of a large international logistics company. We asked the HR department to help us identify a list of people who were knowledge workers performing jobs with enriching characteristics (e.g., autonomy and variety). The department identified 276 employees from dozens of different positions, such as logistics control, analysts, research and development, search engine optimization, visual design, consultants, and purchasing. It also helped us pair these employees with their direct supervisors (a total of 38 supervisors). We sent the surveys via Qualtrics. In the cover letter of the online survey, we explained the purpose of the study, assured the participants of the voluntary nature of their participation and confidentiality, and offered a monetary incentive of US$ 12 for each participant. The response rates for the employee and supervisor surveys were 76.4% and 89.5%, respectively. The final sample included a total of 211 employees and

[2] The analysis using the two stratified classes similarly supported our hypotheses and theory.

34 matched supervisors. Among the participants in the final sample, 60.2% were male, the average age was 29.2 years, and the average job tenure was 4.4 years.

We measured temporal predictability, task segmentation, and experienced passage of time in the employee survey and job performance in the supervisor survey.

**Measures**

Unless otherwise stated, all variables were measured on a five-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree).

***Temporal predictability, task segmentation, and experienced passage of time***. We used the same measures as in Study 2; the reliability scores were .86, .82, and .88, respectively.

***Job Performance.*** Supervisors rated each employee's job performance using the five-item scale developed by Williams and Anderson (1991): a sample item is "The employee adequately completes assigned duties." The reliability score was .87.

**Research Findings**

Table 5 presents the descriptive statistics and variable correlations. We first performed a CFA for all the latent variables, including temporal predictability, task segmentation, experienced passage of time, and job performance. The measurement model had a good fit ($\chi^2$ (120) = 222.14; CFI = .94; RMSEA = .06; SRMR = .05).

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Insert Tables 5 and 6 about here
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As shown in Table 6, we found in a multilevel analysis with Bayesian estimator that temporal predictability was positively related to experienced passage of time (B = .13; *p* = .00), task segmentation was positively related to experienced passage of time (B = .21; *p* = .00), and experienced passage of time was positively related to supervisor ratings of job performance (B = .28; *p* = .00). We also computed the hypothesized indirect effects via experienced passage of time; they were both statistically significant. Please note that Monte

Carlo simulation was used to produce these indirect effects and their confidence intervals. Specifically, temporal predictability significantly influenced job performance through experienced passage of time (indirect effect = .03; 95% CI = [.01, .08]), and task segmentation significantly influenced job performance through experienced passage of time (indirect effect = .05; 95% CI = [.01, .13]). Hypotheses 1, 2, 3, and 4 were all supported.

## STUDY 4: ONLINE SURVEY

In Study 4, we collected data from participants recruited through MTurk. We invited full-time employed participants to complete three surveys at three time points in exchange for a small monetary incentive. We introduced time lags to reduce potential common method variance (Podsakoff, MacKenzie, & Podsakoff, 2012). At Time 1, we measured temporal predictability, task segmentation, the five dimensions of the job characteristics model, and demographic information. A week later, at Time 2, we measured experienced passage of time and the established mechanisms of classic work design (i.e., experienced meaningfulness, experienced responsibility, and knowledge of results). Another week later, at Time 3, we measured job performance. We sent the first survey link to 400 participants. After matching the three waves of data together, we had 270 sets of complete and valid questionnaires, resulting in a response rate of 68%. Among the participants in the final sample, 53% were male, the vast majority (93%) held one job, the average age was 39.9 years, and the average tenure was 8.1 years. The participants were from diverse industries and performed a wide range of jobs, including project coordinator, IT analyst, teacher, driver, construction worker, and plumber.

### Measures

Unless otherwise stated, all variables were measured on a seven-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree).

***Temporal predictability, task segmentation, and experienced passage of time.*** We used the same scales as in the previous survey studies to measure these three variables. The Cronbach's alphas were .95, .86, and .94, respectively.

***Job performance.*** We measured this variable using a three-item scale (Ashford & Black, 1996; Wu, Parker, & De Jong, 2014). We followed the recommendation of Schoorman and Mayer (2008) and instructed participants to take their supervisors' perspective when providing ratings ("Your answers should be based on how your supervisor would evaluate you"). Participants evaluated how well they had done regarding three aspects of job performance (e.g., "the overall performance"; $\alpha$ = .89) on a seven-point Likert-type scale ranging from 1 (very poorly) to 7 (very well).

***Control variables.*** We controlled for all five dimensions of the job characteristics model (Hackman & Oldham, 1975) to demonstrate the unique predictive power of temporal predictability and task segmentation on experienced passage of time. These variables were measured using Morgeson and Humphrey's (2006) Work Design Questionnaire: job autonomy (e.g., "The job gives me considerable opportunities for independence and freedom in how I do the work"; $\alpha$ = .92), task variety (e.g., "The job involves doing a number of different things"; $\alpha$ = .96), task significance (e.g., "The job itself is very significant and important in the broader scheme of things"; $\alpha$ = .96), task identity (e.g., "The job is arranged so that I can do an entire piece of work from beginning to end"; $\alpha$ = .91), and feedback (e.g., "The job itself provides feedback on my performance"; $\alpha$ = .95).

In addition, to demonstrate the unique explanatory effect of experienced passage of time, we included three critical psychological states that represent the established mechanisms of job characteristics: experienced meaningfulness, experienced responsibility, and knowledge of results (Hackman & Oldham, 1976). We assessed experienced meaningfulness using a five-item scale from Bunderson and Thompson (2009): a sample item is "I have a meaningful job" ($\alpha$ = .97). We measured experienced responsibility using a four-item scale from Hackman and Oldham (1975): a sample item is “I feel a very high degree of personal responsibility for the work I do in this job” (α = .80). Knowledge of results was measured using a three-item scale, also from Hackman and Oldham (1975): a sample item is “I usually know whether or not my work is satisfactory in this job” (α = .86).

**Descriptive Statistics and Confirmatory Factor Analyses**

Table 7 presents the means, standard deviations, and bivariate correlations of all variables. A CFA showed that the hypothesized measurement model yielded a good model fit ($\chi^2(879) = 1591.29$; CFI = .93; RMSEA = .06, SRMR = .05).

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Insert Table 7 about here
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**Hypotheses Tests**

We tested our integrative model as a whole in Mplus 8.0. The hypothesized mediator (experienced passage of time) and the three control mediators (experienced meaningfulness, experienced responsibility, and knowledge of results) were regressed on the two independent variables (temporal predictability and task segmentation) and the five dimensions of the job characteristics model; the outcome variable (job performance) was regressed on all the other variables. Table 8 presents all the results.

As expected, after controlling for autonomy, task variety, task significance, task identity, and feedback, our results showed that temporal predictability was positively associated with experienced passage of time (B = .11, $p = .03$). Similarly, task segmentation was also positively associated with experienced passage of time (B = .15, $p = .04$). Thus, both hypotheses were supported.

Regarding Hypotheses 3 and 4, there was a positive relationship between experienced passage of time and job performance (B = .11, $p = .01$), even after we controlled for the effects of experienced meaningfulness, experienced responsibility, and knowledge of results. We tested the indirect effects using bootstrapping. The results showed that the indirect paths from both temporal predictability and task segmentation to job performance through experienced passage of time were significant (indirect effect = .01, 95% CI = [.002, .033]; indirect effect = .02, 95% CI = [.002, .044], respectively), thereby supporting Hypotheses 3 and 4.

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Insert Table 8 about here
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## GENERAL DISCUSSION

Studies 1a and 1b are two experiments that found the positive effects of temporal predictability and task segmentation on experienced passage of time and task performance. With two well-controlled conditions, we can confidently attribute the observed differences in experienced passage of time and task performance to temporal predictability (Study 1a) and task segmentation (Study 1b).

Study 2 documented the natural consequences of temporal predictability and task segmentation in a garment factory. The factory implemented different levels of temporal predictability and task segmentation among its employees, showing that our theory is relevant to field settings. This high level of contextualization strengthens the external validity of our theory (Rousseau & Fried, 2001).

Study 3 tested the research model among knowledge workers in an international logistics company. It found that knowledge workers with higher temporal predictability and task segmentation had faster time experience, which led to better supervisor-rated job performance. This study showed that our research model is applicable to jobs with enriching characteristics.

Study 4 is a time-lagged, MTurk survey that involved research participants with even more diverse job titles. It showed that temporal predictability and task segmentation influenced experienced passage of time above and beyond the classic enriching job characteristics and that experienced passage of time mediated these effects above and beyond the established mechanisms of critical psychological states. It provided further evidence to the generalizability of our findings and connected the research model with the broader work design literature.

These five studies should be interpreted together. Specifically, Studies 1a, 1b, 2, 3, and 4 established the generalizability of our research model and showed that the model is not only applicable to simple, mechanistic jobs but also relevant to jobs with enriching characteristics. In addition, Studies 1a and 1b are relatively weak in external validity because the manipulated task structures might not hold in real work settings. Studies 2, 3, and 4 addressed this problem in three different field settings and showed that temporal predictability and task segmentation are real and relevant at work. Moreover, temporal predictability and task segmentation were measured by experimental manipulation (Studies 1a and 1b) and first-hand survey responses (Studies 2, 3, and 4). Such diversification in the measurement of the predictors enhances our confidence about the robustness of their effects. Finally, the validity of the performance-related link was bolstered by using different ways to measure the outcome variable: objective data (Studies 1a and 1b), company archival data (Study 2), supervisor-rated data (Study 3), and self-reported data (Study 4). Overall, we utilized different research designs, and our findings were consistent across five distinct studies. The package of these five studies, despite their individual limitations, together presents a strong case for the direct effects of temporal predictability and task segmentation on experienced passage of time and their mediated indirect effects on job performance.

## Theoretical Implications

First, our research advances work design theory, which documents the profound impact of work characteristics on employees' work attitudes, behaviors, and well-being (Campion, Mumford, Morgeson, & Nahrgang, 2005). The enriching models of work design, such as the job characteristics model (Hackman & Oldham, 1976) and its more recent extended versions (e.g., Parker, Wall, & Cordery, 2001), have dominated explanations of the positive impacts of job design. Even new theories emphasizing the relational aspects (Grant, 2007; Parker, 2014) or temporal aspects (Cummings et al., 2009; Spreitzer et al., 2017) of jobs have followed suit in terms of their focus on enrichment. Scholars have called for new job characteristics and mechanisms that extend beyond these models because they cannot completely explain the dynamism of jobs in all situations (Parker, Ohly, Kanfer, Chen, & Pritchard, 2008; Parker, 2014).

We address this call with a novel focus on a time-oriented approach to work design. Our results indicate that temporal work design structures can exert a significant influence on employees' time experience and productivity[3]. We identify two new work characteristics (temporal predictability and task segmentation) to complement previous studies. These two features speed up employees' experienced passage of passage not by enriching jobs but by directing employees' attention away from temporal cues. We offer a new theoretical mechanism by which attributes of work design can shape valued work outcomes, such as job performance. Our research takes a theoretical and empirical step forward in the temporal realm of job design (Parker, 2014).

Second, our theory suggests an alternative lever for improving work. The set of internally satisfying features identified in the work design literature lacks in many jobs. This fact is confirmed by a national survey conducted by The Society for Human Resource Management (SHRM), which documented that 36% of participants reported that their jobs had no enriching work characteristics, and 29% only had one or two such dimensions in their jobs (SHRM, 2016). Indeed, although not impossible, it is difficult in practice to enrich certain simple, standardized, and routine jobs on the basis of traditional work design theories

[3] We note that our findings suggested that temporal predictability and task segmentation had weak direct effects on job performance (except in Studies 1a and 1b), and that they can only influence job performance via experienced time passage.

(Parker, 2014). For example, many practical constraints may be involved in attempts to provide autonomy and task variety to assembly line workers, such as those in our Study 2. However, the experienced passage of time is relevant to most types of work (Bakker & Demerouti, 2008). We have confirmed our model among manufacturing workers in Study 2, full-time employees from different backgrounds in Studies 1 and 4, and knowledge workers in Study 3, and in both Western (Studies 1a, 1b, and 4) and Eastern (Studies 2 and 3) contexts. Our approach expands the possibilities for improving work quality. It does so in a way that might be politically and economically feasible in highly routinized contexts in which job enrichment strategies are unlikely to be implemented.

Finally, our research informs the existing research on flow (Csikszentmihalyi, 1990). Flow is an optimal human experience in which an individual is fully immersed in an activity, with energized focus, heightened enjoyment, and temporal distortion (Quinn, 2005). Experiencing the faster passage of time through the flow approach, or being "in the zone," requires many prerequisites to be in place, such as a motivating job with autonomy, a balance between a very challenging task and a highly skilled person, and a sense of control (e.g., Fong, Zaleski, & Leach, 2015; Nakamura & Csikszentmihalyi, 2009). Therefore, flow-related time distortion is often studied among highly artistic or creative "fun" jobs (e.g., Martin & Cutler, 2002; Moneta, 2012). However, experienced passage of time, as theorized in our paper, represents a broader view, such that any activity, even the least intellectually stimulating (such as the tasks in our Studies 1a, 1b, and 2), has the potential to generate a faster passage of time when it features temporal predictability and task segmentation. Our research is guided by the premise that the fast passage of time, as a positive experience in and of itself, can be achieved through work design and can result in improved job performance. The fast passage of time does not necessarily require a job to be highly artistic or creative to produce a flow experience, although our Study 4 found that the established enriching characteristics (e.g., job autonomy, skill variety) are associated with a faster temporal experience. In other words, we do not limit the study of experienced passage of time to a rare extreme; rather, we conceptualize it as a generalizable construct that applies to a broader range of jobs.

**Practical Implications**

The work design literature is characterized by its strong practical implications. By conceptualizing work characteristics and investigating their effects, the literature has helped inform how managers can enhance employees' attitudes and productivity by altering these design elements. Similarly, our paper uncovers the associations of two work characteristics with experienced passage of time and, subsequently, job performance. Our findings imply that work time can and should be designed to help employees stay focused. Because temporal predictability and task segmentation can be flexibly designed, they offer strong action implications for managers. Specifically, based on our study's findings, managers can, in some situations, eliminate unnecessary wait times or at least reduce the uncertainty of wait times. For example, looking back to the support workers in the garment factory in Study 2, their managers could give them other tasks to do while they are "waiting" to increase temporal predictability. Consider meetings as a further example: Management research has shown that the number of meetings held is negatively related to employees' job attitudes and well-being (Rogelberg, Leach, Warr, & Burnfield, 2006). From a temporal predictability perspective, an employee is likely to have heightened time awareness and to become more attentive to time if he or she must wait for an uncertain amount of time for a meeting to start or to end, whereas a person's level of time awareness will be lower if he or she is told the exact timings involved. Our research findings shed light on a better design of meetings.

In addition, our findings suggest that managers can punctuate the workday with temporal markers, during which employees engage in different types of activities. When their attention starts to wane, they can restore their attention through these markers, such as in the case of the study of banana time we discussed earlier (Roy, 1959). Research has found that breaks are effective only if employees use them to engage in activities that are categorically different from their work (Trougakos, Hideg, Cheng, & Beal, 2014). This finding is consistent with our suggestion of using task segmentation. Managers should design task segmentation with caution though, especially for complex jobs. It might be detrimental to job performance if a job is too segmented. Theoretically, a temporal marker should be used when one's vigilance level to the focal task starts to diminish. It will be a distraction when employees are still in the deep processing of the focal task (Leroy, 2009). Managers therefore should consider customizing task segmentation to different jobs or even to different people. Again, our paper provides a principle for managers to think about the work design— the use of a temporal marker helps employees to stay focused.

It is also critical for managers to heed that the purpose behind work design from a time perspective should be enabling rather than coercive (Adler & Borys, 1996). Employees are willing to perform well, but the loss of attention is involuntary and inevitable. Because experiencing the fast passage of time is a positive experience for employees, the proper design of time structure at work allows managers to play an important role in helping their employees to stay focused. The design of time we suggest differs from Taylorism, which aims to specify the standard time and motion that employees must spend on a task and to coercively control employees' time using those standards (Taylor, 1911). The design of work time cannot change the characteristics of some core jobs (e.g., simple, repetitive, and strenuous tasks), but it might better protect employees who perform such tasks from the damaging influence of unpleasant job characteristics by giving them the feeling that time is flowing quickly. Consider the mining industry, in which miners work underground for long hours. Although technological advances have reduced the risks associated with mining, miners are still exposed to uncomfortable and hazardous work environments (Pule, 2011). In such situations, the experience of time passing quickly (versus constantly checking the time left before being allowed to leave the shaft) could significantly improve miners' well-being.

**Limitations and Future Research Directions**

We tested our theory in multiple studies with different designs and across different cultures. The consistency of the results bodes well for their robustness. Despite the studies' strengths, however, some limitations are worth noting. In calling attention to these limitations, we simultaneously suggest future directions for additional research.

First, as an initial effort, we have identified two time-related work characteristics that divert employee attention away from time (temporal predictability and task segmentation) because our goal was not to develop an exhaustive list of temporal design features. We encourage additional research to explore other relevant work characteristics that may be able to alter one's experienced passage of time. For example, it might be promising to study how unusual work time arrangements, such as emergency room doctors and air traffic controllers that involve frequent night shifts, influence employees' temporal work experience, especially among those with distinct chronotypes (Kühnel, Bledow, & Kiefer, in press; Kühnel, Bledow, & Feuerhahn, 2016).

Second, we have not examined potential boundary conditions of the impacts of temporal predictability and task segmentation. It might be fruitful for future research to investigate how the associations of temporal work features with outcomes are altered by individual differences and/or situational factors. For instance, mindfulness has been found to enable individuals to "live in the present moment" rather than focusing on what will happen in the future (e.g., Siegel, 2007). Therefore, the effect of temporal predictability on changing experienced passage of time may be more pronounced in less mindful people. Moreover, as task segmentation can be implemented by management or employees themselves, the main effects might be altered by whether the segmentation structure is self-initiated or externally imposed.

Finally, in our five studies, we focused on experienced passage of time as the immediate outcome and job performance as the distal outcome of temporal predictability and task segmentation. Although we attempted to establish temporal precedence of experienced passage of time over job performance in our research design, we cannot rule out the reverse causality possibility that experienced passage of time could potentially be a result of job performance. This is worthy of further investigation.

## CONCLUSION

A key message from the current research is that individuals' experienced passage of time can be shaped by temporal work design. We identified and conceptualized temporal predictability and task segmentation as two new temporal work characteristics and showed their effects on job performance via employees' experienced passage of time. Our research provides novel insights into work design research and opens up future research avenues of temporal work design and temporal work experience.

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**TABLE 1**
**Study 1a (Temporal predictability): Descriptive Statistics**

| Condition (1 = high temporal predictability; 0 = low temporal predictability) | | Mean | SD |
|---|---|---|---|
| Manipulation Check | 1 | 2.78 | 1.14 |
| | 0 | 2.36 | 0.74 |
| Experienced Passage of Time | 1 | 3.94 | 0.66 |
| | 0 | 3.63 | 0.85 |
| Performance | 1 | 219.09 | 86.08 |
| | 0 | 144.90 | 75.28 |

*N* = 116

**TABLE 2**
**Study 1b (Task segmentation): Descriptive Statistics**

| Condition (1 = high task segmentation; 0 = low task segmentation) | | Mean | SD |
|---|---|---|---|
| Manipulation Check | 1 | 3.78 | 0.97 |
| | 0 | 3.31 | 0.98 |
| Experienced Passage of Time | 1 | 3.93 | 0.77 |
| | 0 | 3.52 | 0.89 |
| Performance | 1 | 220.83 | 89.97 |
| | 0 | 151.25 | 59.30 |

N = 118

**TABLE 3**
**Study 2: Descriptive Statistics and Correlations among Variables**

| | | Mean | SD | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|
| 1 | Work type[a] | 0.45 | 0.50 | -- | | | | |
| 2 | Temporal Predictability | 3.62 | 0.87 | -.28** | -- | | | |
| 3 | Task Segmentation | 3.17 | 0.71 | -.19† | -.17 | -- | | |
| 4 | Experienced Passage of Time | 4.15 | 0.84 | -.26** | .28** | .10 | -- | |
| 5 | Job Performance | 3.23 | 1.13 | -.20* | -.05 | .10 | .21* | -- |

*N* = 96; † $p < .10$, * $p < .05$, and ** $p < .01$

[a] 0 = sewing machinists; 1 = support workers

**TABLE 4**
**Study 2: Unstandardized Path Estimates**

| | Experienced Passage of Time | Job Performance |
|---|---|---|
| Temporal Predictability | .30 (.10)* | -.14 (.13) |
| Task Segmentation | .22 (.12)† | .12 (.20) |
| Experienced Passage of Time | | .31 (.16)* |

*N* = 96; † $p < .10$, * $p < .05$, and ** $p < .01$

**TABLE 5**
**Study 3: Descriptive Statistics and Correlations among Variables**

| | | Mean | SD | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|
| 1 | Temporal Predictability | 3.63 | 0.93 | -- | | | |
| 2 | Task Segmentation | 3.42 | 0.81 | -.13 | -- | | |
| 3 | Experienced Passage of Time | 4.22 | 0.63 | -.08 | .23** | -- | |
| 4 | Job Performance | 4.34 | 0.50 | -.00 | -.03 | .16* | -- |

*N* = 211; $^{*}p < .05$ and $^{**}p < .01$

**TABLE 6**
**Study 3: Unstandardized Path Estimates with Multilevel Modeling**

| | Experienced Passage of Time | Job Performance |
|---|---|---|
| Temporal Predictability | .13 (.05)** | -.10 (.09) |
| Task Segmentation | .21 (.07)** | -.04 (.06) |
| Experienced Passage of Time | | .28 (.08)** |

*N* = 211; $^{**}p < .01$

**TABLE 7.**
**Study 4: Descriptive Statistics and Correlations among Variables**

| | Variables | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Autonomy | 5.33 | 1.22 | -- | | | | | | | | | | | |
| 2 | Task Variety | 5.24 | 1.19 | .18** | -- | | | | | | | | | | |
| 3 | Task Significance | 4.83 | 1.60 | .07 | .40** | -- | | | | | | | | | |
| 4 | Task Identity | 5.29 | 1.20 | .21** | -.11 | .13* | -- | | | | | | | | |
| 5 | Feedback | 5.23 | 1.28 | .15* | .09 | .35** | .42** | -- | | | | | | | |
| 6 | Temporal Predictability | 4.90 | 1.57 | .29** | .09 | .13* | .34** | .24** | -- | | | | | | |
| 7 | Task Segmentation | 4.78 | 1.19 | .18** | .11 | .06 | .11 | .22** | .09 | -- | | | | | |
| 8 | Experienced Passage of Time | 4.33 | 1.42 | .29** | .26** | .30** | .29** | .29** | .29** | .22** | -- | | | | |
| 9 | Experienced Meaningfulness | 4.92 | 1.54 | .11 | .42** | .78** | .14* | .30** | .21** | .14* | .47** | -- | | | |
| 10 | Experienced Responsibility | 5.69 | 0.95 | .22** | .26** | .31** | .27** | .38** | .34** | .12 | .39** | .42** | -- | | |
| 11 | Knowledge of Results | 5.72 | 1.02 | .16** | .20** | .21** | .30** | .42** | .38** | .05 | .29** | .30** | .59** | -- | |
| 12 | Job Performance | 6.09 | 0.86 | .17** | .16** | .27** | .32** | .33** | .21** | .10 | .36** | .29** | .37** | .41** | -- |

$N = 270$; $^{*}p < .05$ and $^{**}p < .01$.

**TABLE 8.**
**Study 4: Unstandardized Path Estimates**

| | **Experienced Passage of Time** | Experienced Meaningfulness | Experienced Responsibility | Knowledge of Results | **Job Performance** |
|---|---|---|---|---|---|
| Autonomy | .17 (.07)$^{*}$ | -.01 (.04) | .05 (.05) | -.00 (.05) | .02 (.04) |
| Task Variety | .19 (.07)$^{**}$ | .15 (.06)$^{**}$ | .14 (.05)$^{**}$ | .15 (.06)$^{*}$ | .02 (.04) |
| Task Significance | .14 (.05)$^{**}$ | .70 (.04)$^{**}$ | .07 (.04)$^{*}$ | -.01 (.05) | .08 (.05) |
| Task Identity | .20 (.08)$^{*}$ | .03 (.07) | .08 (.05) | .09 (.06) | .11 (.05)$^{*}$ |
| Feedback | .08 (.08) | -.01 (.06) | .17 (.06)$^{**}$ | .26 (.07)$^{**}$ | .03 (.06) |
| **Temporal Predictability** | **.11 (.05)$^{*}$** | .09 (.04)$^{*}$ | .12 (.04)$^{**}$ | .17 (.04)$^{**}$ | -.02 (04) |
| **Task Segmentation** | **.15 (.07)$^{*}$** | .10 (.06) | -.00 (.05) | -.07 (.04) | .01 (04) |
| **Experienced Passage of Time** | | | | | **.11 (.04)$^{**}$** |
| Experienced Meaningfulness | | | | | -.03 (.05) |
| Experienced Responsibility | | | | | .07 (.07) |
| Knowledge of Results | | | | | .20 (.07)$^{**}$ |
| $R^2$ | .26$^{**}$ | .64$^{**}$ | .28$^{**}$ | .29$^{**}$ | .27$^{**}$ |

*N*= 270. $^{*}p < .05$ and $^{**}p < .01$.

## Biographical Sketches

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