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Putting the Episodic Process Model to the Test: Explaining Intraindividual Fluctuations in Job Performance across the Working Day

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Abstract

We used ecological momentary assessments to examine the predictive value of the episodic process model to explain within-person fluctuations in job performance across the working day.
Our sample consisted of 330 employees in knowledge-intensive jobs working fairly regular office hours, who responded to digital hourly surveys across one entire working day (2,078 hourly measurements).
Confirming the main predictions of the episodic process model of performance, multilevel analyses demonstrated that episodic energy levels (i.e., regulatory resources), as well as episodic task significance (i.e., task attentional pull) were related to higher levels of self-reported episodic performance. Additionally, in line with the episodic process model, a moderation analysis revealed that under conditions of low energy levels, episodic performance remains high if task significance is high (i.e., high task attentional pull). We moreover tested whether task attentional pull (time pressure, task significance) and off-task attentional demands (resisting distractions from work) jointly predicted episodic performance. The interaction effect on episodic performance of time pressure and resisting distractions revealed that the pull-effect of time pressure was more pronounced under conditions of low off-task attentional demands, thus lending additional support to the predictions of the episodic process model. Overall, our results show how the episodic process model can indeed explain within-person variations in performance across the working day. Our findings moreover underline the importance of energy levels at work for job performance.

Keywords: episodic process model, performance, within-person variability, energy

Putting the Episodic Process Model to the Test:
Explaining Intraindividual Fluctuations in Job Performance across the Working Day

Research on job performance lies at the heart of and is the historical cornerstone of industrial and organizational psychology. High job performance is crucial to the success of organizations (Biron & Boon, 2013; Guest, 2011) and predicting, preserving and improving employees' job performance is a core objective of every organization. Within the last decades, psychological research has achieved immense progress in addressing this aim and has, for example, demonstrated that differences in employees' performance can be traced back to relatively stable differences between employees such as personality or job attitudes or to organizational structures (e.g., Barrick & Mount, 1991; Hurtz & Donovan, 2000; Judge, Thoresen, Bono, & Patton, 2001; Stajkovic & Luthans, 1998; Tett, Jackson, & Rothstein, 1991; Wanous, 2001).

However, high job performance is not a stable characteristic of certain employees, but varies from year to year, month to month, week to week, day to day, or even from moment to moment (e.g., Beal, Weiss, Barros, & MacDermid, 2005; Deadrick, Bennett, & Russell, 1997; Merlo, Shaughnessy, & Weiss, 2018; Ployhart & Hakel, 1998; Wright, Cropanzano, & Meyer, 2004). Indeed, previous research has shown that a considerable amount of the variability of performance resides within-persons (e.g., Dalal, Bhave, & Fiset, 2014). Until the introduction of the episodic process model by Beal et al. (2005), theoretical models to explain this variability and its fluctuations over time have been lacking.

So far only few studies have shed light on why employees perform well at one moment and poorly at another. Identifying factors that explain why performance varies across time within individuals is just as important as identifying factors predicting between-person differences in performance to test and further develop theories that can predict not only what happens and why, but also when and to what degree. Investigating performance as a dynamic construct, which varies both between persons and within persons over time can increase our understanding of a crucial workplace phenomenon. Workplaces are dynamic environments and should be examined accordingly – dynamically across time (Wagner & Illies, 2008). From a practitioner point of view, this knowledge about performance can enable employers to address and change factors detrimental or conducive to their employees' job performance and build up more sustainable human resource management practices.

The present study aims at identifying factors predicting episodic performance. The underlying theoretical model guiding our investigations is the episodic process model of performance (Beal et al., 2005). This model was introduced to account for within-person fluctuations in job performance. In order to capture within-person job performance, Beal et al. (2005) introduced performance episodes as describing "the temporal progression of people's work-related activities through the day. These episodes are time-bound units of work activity, nested within tasks" (p. 1056). Performance episodes define relatively short temporal units within a workday, that are organized around relevant goals (Beal et al., 2005). Beal et al., (2005) further postulate that performance *within* a given performance episode is dependent on "the process that determines whether people can and will focus their resources on accomplishing the primary work task" (Beal et al., 2005, p. 1058). The model further describes this process as dependent on fluctuating person factors (termed regulatory resources) that are available at a given performance episode (e.g., energy levels), as well as fluctuating environmental factors that are present during a given performance episode that either attract people's attention to (termed task attentional pull) or distract people from the task at hand (termed off-task attentional demand). The goal of the present study is to use an ambulatory assessment design to capture self-rated performance episodically (within-person) and to add to the sparse empirical studies testing the main propositions of the episodic process model of performance (Beal et al., 2005). Therefore, the focus of the present investigation is to build on the Beal et al. (2005) model in order to derive hypotheses regarding predictors of performance *within* a given performance episode, and empirically test these predictions on an episodic level.

Our study adds to the existing body of literature in two important ways: First, identifying factors related to episodic performance is important due to the considerable amount of variance of performance within person (Dalal et al., 2014). Our study also addresses the interrelation between theoretical proposed predictors of episodic performance (see episodic process model of performance, Beal et al., 2005) and examines the role of energy levels as a regulatory resource. Specifically, in the present study we investigate both varying environmental (i.e., task characteristics) and varying person factors (i.e., energy levels) as well as their joint effects in predicting episodic performance. Investigating predictors stemming from persons and from the environment and their interplay offers an ecologically valid representation of the work context (Karasek, 1979; Lazarus & Folkman, 1984) and constitutes a direct empirical test of the theoretical model proposed by Beal and colleagues (2005). Second, incorporating varying person and situational factors to explain within-person variability in job performance will yield ideas for interventions targeting either the individual worker, the environment or both. This means that our study also has practical implications for the workplace.

In the following sections, we first derive hypotheses on the relevance of the fluctuating person factors (regulatory resources) available at a given moment in time and of fluctuating environmental factors that either attract people's attention to the task at hand or distract them from the task at hand for episodic performance. Next, we derive hypotheses on how the interplay of these factors relates to episodic performance.

Regulatory Resources: The Relationship between Energy and Self-Reported Episodic Performance

To perform well in a given situation, it is important that employees apply their abilities to the task at hand (Beal et al., 2005; Heckhausen & Gollwitzer, 1987; Minbashian & Luppino, 2014). Hence, irrespective of person differences in abilities and character traits that differentiate between good and bad performers (between-person effects; for meta-analyses, see for example Judge & Bono, 2001; Schmidt & Hunter, 2004), for episodic performance in a given situation the ability to put these individual potentials into action is necessary (within-person effects, Beal et al., 2005; Binnewies, Sonnentag, & Mojza, 2009; 2010; Fisher & Noble, 2004). In terms of the episodic process model of performance, the regulatory resources available in the present performance episode determine performance during that given episode (see Beal et al., 2005).

Regulatory resources help employees to regulate the process to obtain the goals of a specific performance episode. Regulatory resources describe fluctuating person factors that help employees focus their attention on the task at hand, thereby facilitating performance in a given moment (Beal et al., 2005; Muraven & Baumeister, 2000). Mood is one factor which has been investigated as a within-person predictor of performance (Dalal, Lam, Weiss, Welch, & Hulin, 2009; Koy, & Yeo, 2008; Rothbard & Wilk, 2011; Shockley, Ispas, Rossi, & Levine, 2012). Moods are diffuse affective states that provide the affective background for our experiences, behaviors and cognitions (Wilhelm & Schoebi, 2007). Past research has shown that inter-

(between-person) and intraindividual (within-person) differences in positive and negative well-being indicators (e.g. moods) are related to several organizational outcomes, such as job performance, decision making, creativity, organizational citizenship behavior, and proactive behavior (Barsade & Gibson, 2007; Miner & Glomb, 2010; Pelled & Xin, 1999; Sonnentag, 2015). Additionally, there is evidence for between-person effects of state and trait negative and positive well-being indicators with employee withdrawal behavior such as absenteeism or intention to quit (Barsade & Gibson, 2007; Sonnentag, 2015).

On an episodic basis, energetic arousal can be conceptualized as a crucial mood facet (Fritz, Lam, & Spreitzer, 2011; Ryan & Deci, 2008; Zijlstra, Cropley, & Rydstedt, 2014). Energetic arousal constitutes a high arousal mood state characterized by feeling awake and energetic (Wilhelm & Schoebi, 2007). Energetic arousal has been suggested as a key factor in work performance (Quinn, Spreitzer, & Lam, 2012). Energetic arousal broadens people's repertoires of thoughts and actions (Fredrickson, 2009; Fredrickson & Branigan, 2005), which in turn enables employees to deploy more resources. High arousal mood states can counteract the effects of regulatory depletion, increasing employees´ ability to engage in self-control (Tice, Baumeister, Shmueli, & Muraven, 2007). Affective shifts from high-arousal negative to high-arousal positive affective states have been associated with high work engagement (Bledow, Schmitt, Frese, & Kühnel, 2011). In a similar vein, diary studies on recovery from work during off-job time have also demonstrated that energetic states (i.e., feeling recovered) predict performance at work (Binnewies et al., 2009; 2010; Fritz & Sonnentag, 2005). However, the existing research on energy and performance has focused on performance across longer time spans (i.e., between days, weeks). Our study complements this research by focusing on self-reported episodic performance within a working day. Additionally, a previous study using the episodic process model as a theoretical framework highlighted that positive and negative affect are antecedents of episodic performance (Merlo et al., 2018). However, the authors did not focus on the arousal component of affect, which is the main focus in the present study. In our view, energy adequately captures what Beal et al. (2005) refer to as regulatory resources. By applying Beal and colleagues´ episodic process model of performance (2005), we hypothesize accordingly:

Hypothesis 1: Employees' episodic energy level is positively related to self-reported episodic performance (within-person effect).

Task Attentional Pull and Off-Task Attentional Demand: The Relationship between Time Pressure, Task Significance, and Resisting Distractions with Self-Reported Episodic Performance

Performance during an episode is postulated to be at its best if an employee's attention is fully dedicated to the work task at hand as opposed to being dedicated to distractions emanating from non-work tasks (Beal et al., 2005). Maintaining attentional focus on the work task is supported by characteristics of the work task that make it more interesting and more important and thus, attending to it less effortful. In the terminology of Beal and colleagues' (2005) model, these characteristics of the task are reflected in the concept of "task attentional pull".

We take account here of task significance and time pressure as task characteristics that enhance episodic performance (task attentional pull factors). Time pressure is the extent to which employees feel that they have insufficient time to accomplish their work tasks, or that they need to work at a faster pace than usual because the amount of work to be done exceeds the capacity available (Roe & Zijlstra, 2000). When employees experience time pressure, they are more likely to appraise their tasks as challenging (Prem, Ohly, Kubicek, & Korunka, 2017), which should translate into increased effort and concentration on the tasks (Hockey, 1993; LePine, Podsakoff, & LePine, 2005) and thus into higher performance on the task (Ohly & Fritz, 2010; Van Laethem, Beckers, Bloom, Sianoja, & Kinnunen, 2018). However, there is evidence that a positive relationship between time pressure and performance emerges on the within-person level of analysis and for shorter time frames only, but not on the between-person level and for longer time frames. For example, Baethge, Vahle-Hinz, Schulte-Braucks, and van Dick (2018) used a daily diary and longitudinal design to show that on the between-person level, time pressure was negatively related to work engagement as a performance related outcome. However, on the within-person level, for shorter time frames (one day or one week) higher time pressure was positively related to work engagement. Accordingly, the authors suggest that time pressure on the between-person level represents a more stable work characteristic that relates negatively to performance, but time pressure on the within-person level may represent fluctuating states of time pressure that can exhibit (depending on the time frame) a positive effect on performance. Further support for a positive within-person relationship between episodic time pressure and performance stems from a study by Fisher and Noble (2004) who reported a positive direct within-person relationship between effort (which was assessed very similarly to time pressure) and performance. In light of theoretical considerations suggesting a challenging effect of time pressure (LePine et al., 2005) and empirical evidence of a positive within-person relationship between time pressure and performance (Baethge et al., 2018; Fisher & Noble, 2004), we hypothesize:

Hypothesis 2: Episodic time pressure is positively related to self-reported episodic performance (within-person effect).

According to the work characteristics model (Hackman & Oldham, 1980), task significance fosters the belief that one's actions are meaningful and important, serving a greater goal. Meaningful tasks at work help people to connect present actions to future events and states (Baumeister & Vohs, 2002), provide a sense of direction and a feeling to moving closer to desired future goals (Rosso, Dekas, & Wrzesniewski, 2010). Empirical studies show that employees who perceive their work to be meaningful report higher well-being (Arnold, Turner, Barling, Kelloway, & McKee, 2007), job satisfaction (Kamdron, 2005), job performance (Grant, 2008), organizational commitment, and intrinsic work motivation (Steger, Dik, & Duffy, 2012). In line with the episodic process model of performance (Beal et al., 2005) we expect that engagement in an upcoming meaningful task constitutes a task attentional pull factor. If the work task itself inspires significant interest in the employees, it should be easier for them to focus their attention on the task at hand and to perform well (Fisher & Noble, 2004). We hypothesize accordingly:

Hypothesis 3: Episodic task significance is positively related to self-reported episodic performance (within-person effect).

Factors of task attentional pull describe varying situational factors that help employees to stay focused on the task at hand. By contrast, in the terminology of Beal and colleagues' (2005) model off-task attentional demands describe situational factors that prevent employees from focusing on the task at hand, such as distractions or interruptions. Resisting distractions and dealing with interruptions occupies attentional resources that could otherwise be used to direct attentional focus to work tasks. Indeed, the literature on the relationship between work characteristics and performance shows that situational constraints (such as interruptions) are negatively related to performance (Dalal, Behave, & Fiset, 2014; Jex, 1998; Rosen, Chang, Djurdjevic, & Eatough, 2010). In line with this, Debusscher, Hofmans, and De Fruyt (2016) argue that state neuroticism is linked to being overly susceptive to negative cues, which consumes resources needed to accomplish the task and therefore decreases episodic task performance.

Resisting distractions describes the self-control demand to ignore any diversions in a given moment to be able to accomplish the task at hand (Schmidt & Neubach, 2007). The continuous effort needed to deal with and resist distractions cannot be invested in the accomplishment of the work task at hand. Thus, resisting distractions hinders task achievement and reduces employees' capacity to perform well in a given situation. Accordingly, when employees have to resist distractions, this indicates high off-task attentional demand, which should be negatively related to episodic performance. Accordingly, we hypothesize:

Hypothesis 4: Episodic resisting distractions is negatively related to self-reported episodic performance (within-person effect).

Putting the Episodic Process Model to the Test: Joint Effects

So far we have considered the direct effects of regulatory resources (energy levels), task-attentional pull factors (time pressure and task significance), and dealing with off-task attentional demands (resisting distractions) on episodic performance. However, the episodic process model of performance also suggests that there are joint effects among these constructs (Beal et al., 2005). Specifically, starting with the direct relationship between regulatory resources (e.g. energy levels) and episodic performance (see Hypothesis 1), the model proposes two moderation effects. Firstly, a compensatory effect of task attentional pull factors (episodic task characteristics) is proposed. Task attentional pull factors may compensate for low regulatory resources (episodic energy levels). In other words, task attentional pull factors are especially relevant for episodic performance when energy levels are low. Secondly, an amplifying effect of off-task attentional demands is proposed. High off-task attentional demands may amplify the relevance of regulatory resources for episodic performance. In other words, energy levels are especially relevant for episodic performance in the presence of high off-task attentional demands. These theoretical propositions result in the following joint effects:

Hypothesis 5 a/b: The positive relationships between task attentional pull factors and self-reported episodic performance is stronger under the condition of low regulatory resources. Specifically, under conditions of low regulatory resources (low episodic energy levels), the positive relationship between task attentional pull factors (high episodic time pressure (a) and high episodic task significance (b)) and self-reported episodic performance is stronger than under conditions of high regulatory resources.

Hypothesis 5 c: The negative relationship between off-task attentional demands and self-reported episodic performance is stronger under the condition of low regulatory resources. Specifically, under conditions of low regulatory resources (low episodic energy levels), the negative relationship between off-task attentional demands (resisting distractions) and self-reported episodic performance is stronger.

Moreover, we argue that characteristics of the task that make attending to it less effortful (task attentional pull) are especially important for maintaining good performance during episodes during which employees face off-task attentional demands. When the tasks are experienced as important and interesting, it should be easier to combat distractions arising from non-work demands. According to Beal et al. (2005), tasks that are characterized by high attentional pull allow employees to remain focused on the task without substantial decrements in regulatory resources. Thus, during episodes when employees are working on tasks with high attentional pull, more regulatory resources are available to successfully resist off-task distractions. Conversely, during episodes when employees are working on tasks that are deemed less urgent and less significant, employees need to expend more effort to maintain attentional focus on the task at hand. Consequently, less regulatory resources remain to resist distractions and employees should thus be more vulnerable to off-task distractions. Taken together, we anticipate that task characteristics that foster task attentional pull (that is, time pressure and task significance) and off-task attentional demands should jointly predict episodic performance. More specifically, high task attentional pull (e.g. high episodic time pressure or high episodic task significance), should buffer the negative effect of high off-task attentional demands (resisting distractions) on episodic performance. We hypothesize accordingly:

Hypothesis 6 a/b: Episodic resisting distractions (off-task attentional demand) interacts with episodic time pressure or episodic task significance (task attentional pull) in predicting self-reported episodic performance. The negative relationship between resisting distractions and momentary performance is alleviated under conditions of high time pressure (a) or high task significance (b).

Method

Procedure and Design

Three hundred and thirty employees completed digital hourly surveys throughout one working day (6.3 times on average). In our sample, the mean length of the working day was eight hours (*SD* = 3.16). Thus the maximum number of obtainable measurements was 2,640. Our data set included 2,078 hourly measurements, indicating a completion rate of 79%. On the next day the employees took a digital survey eliciting demographic information and information on their specific working times during the previous day.

We used ecological momentary assessment "[…] to minimize recall bias, maximize ecological validity, and allow study of microprocesses that influence behavior in real-world contexts" (Shiffman, Stone, & Hufford, 2008, p. 1). By choosing an hourly time interval, we aimed to provide a close alignment to Beal et al.'s (2005) conceptualization of a working day with an underlying episodic structure. Earlier research on affective and performance fluctuations over the workday has shown that the average reported episode length was 65.8 minutes (Merlo et al., 2018), which matches our setup well.

Sample

The sample of our study consisted of 330 white-collar employees working in knowledge-intensive jobs with fairly regular office hours. The respondents were recruited through a convenience sampling approach whereby the authors and their students approached their networks. Participants worked in various organizations in different sectors, the largest of which were engineering, IT, and finance. Respondents' mean age was 35.07 years (*SD* = 12.32, ranging from 18 to 67), and 52% of the sample was female. Weekly working time was 34 hours, average duration of employment was 7.66 years and 71% of the sample had a permanent employment contract, 25% held a leadership position, 74% worked full time. Level of education was distributed as follows: 45.5% held bachelor's, master's or higher academic degrees, 22.2% a high-school qualification, 16% had a completed vocational training, 13% basic compulsory education. The majority (60%) were married or co-habiting and 26% had at least one underage child living with them. As an incentive to participate, participants were offered the option to get feedback on the results of the study.

Hourly Measures

Regulatory resources: Energy. Energy level was assessed with the two corresponding items from the mood questionnaire by Wilhelm and Schoebi (2007). During each hour, respondents were asked to respond on bipolar items to the statement “At this moment I feel tired - awake” and “…full of energy – without energy”. The endpoints 1 and 5 were associated with the label “very”. Mean intercorrelation was .66.

Task attentional pull: Task significance and time pressure. Task significance was assessed with one item adapted from the Work Design Questionnaire (Morgeson & Humphrey, 2006, German version: Stegmann et al. 2010). “The tasks I was working on during the last hour were very important”, rated on a 5-point Likert scale ranging from 1 = *completely disagree* to 5 = *completely agree*.

Time pressure was measured with two items from the ISTA—the Instrument for Stress Oriented Task Analysis (Semmer, Zapf, & Dunckel, 1999), used in Kühnel, Bledow, and Feuerhahn (2016). The items were adapted so that they referred to the last hour : “Within the last hour, I was under time pressure” and “Within the last hour, I had to work at high speed”. Items were rated on a 5-point Likert scale ranging from 1 = *completely disagree* to 5 = *completely agree*. Mean intercorrelation was .84.

Off-task attentional demand: Resisting distractions. We assessed resisting distractions with the following two items from the self-control demand scale by Schmidt and Neubach (2010): “In order to achieve my work goals, I could not afford any distractions in the last hour.” and “For the past hour, my work has required me to ignore distractions.” Items were rated on a 5-point Likert scale ranging from 1 = *completely disagree* to 5 = *completely agree*. Mean intercorrelation was .88.

Episodic performance. We assessed self-reports of episodic performance with two items from Kallus and Kellmann (2016) on a 5-point rating scale, ranging from 1 = *completely disagree* to 5 = *completely agree*. The items are “Within the last hour, I was satisfied with my performance” and “Within the last hour, I accomplished a lot”. Mean correlation between the items was .73.

Analytic Strategy

We followed Bliese and Ployhart (2002) in estimating multilevel models in R, using the NLME library written by Pinheiro and Bates (2000), and restricted maximum likelihood for estimation. Multilevel modeling techniques were used to account for the non-independence of the data as well as for the systematic, chronological structure of the data (by including time as a predictor). We followed Raudenbush and Bryk (2002) and included hour-level predictors (person-mean centered, depicting within-person variance) and aggregated hour-level predictors (grand-mean centered, capturing the overall level of the predictor across the day), so that the effect is broken down into within- and between-person components and the between-person effect does not inherit the relationships within persons. In order to compare non-nested models, we focus on the Akaike Information Criterion (AIC) fit statistic as we examine a complex model and expect moderate or small effects (Vries, 2012).

Results

Table 1 presents the means, standard deviations, and zero-order correlations between the study variables.

---Insert Table 1 about here---

Preliminary Analysis

Before testing our hypotheses, we determined the strength of data non-independence and estimated a null model (Raudenbush & Bryk, 2002). The intra-class correlation coefficient (ICC1) for performance was .28, indicating that approximately a quarter of the variance in individual ratings of performance was due to inter-individual differences and that there was also substantial variance within persons across hours. The results showed a linear ($\gamma = .02$, $SE = .01$, $t = 3.04$, $p < .01$) time trend. Additionally, the model that included autocorrelation ($\Phi = .20$) but did not incorporate heterogeneity in the error structures fitted best.

Hypotheses Testing

In Model 1, (Table 2) we tested the relationship between regulatory resources (i.e. energy) and episodic performance to test Hypothesis 1. The results showed that energy within persons was significantly related to performance ($\gamma = .24$, $SE = .03$, $t = 9.07$, $p < .001$). Energy explained 14% of the variance of performance within persons. Thus, Hypothesis 1 was supported.

---Insert Table 2 about here---

In Model 2, we examined the relationship between task attentional pull (i.e. time pressure, task significance) and off-task attentional demands (i.e. dealing with distractions) with episodic performance. The AIC fit statistic implies that model 2 fitted the data better compared to model 1. Our results showed that, contradicting Hypothesis 2, time pressure ($\gamma = .01$, $SE = .02$, $t = 0.58$, $p = .56$) was not related to episodic performance. Confirming Hypothesis 3, task significance ($\gamma = .32$, $SE = .02$, $t = 16.43$, $p < .001$) was significantly positively related to performance within the same hour. Further, contradicting Hypothesis 4, resisting distractions was *positively* related to performance ($\gamma = .14$, $SE = .02$, $t = 6.71$, $p < .001$). The predictors explained 28% of the variance in episodic performance.

In Model 3, we tested whether energy interacted with task significance, time pressure, and resisting distractions. The AIC fit statistic does not indicate a preference of model 3 compared to model 2. Our results showed that the two-way interaction between energy and time pressure was not significant, contradicting Hypothesis 5a. In line with Hypothesis 5b, the interaction between energy and task significance was significant ($\gamma = -.10$, $SE = .03$, $t = -3.45$, $p < .001$). This interaction indicates that under conditions of low regulatory resources (low energy levels) high levels of task attentional pull in the form of task significance enable high levels of episodic performance (Figure 1). Simple slope analyses supported this reasoning by indicating that energy and episodic performance were strongly related at low ($\gamma = .24$, $SE = .03$, $t = 7.43$, $p < .001$) and at medium levels of task significance ($\gamma = .15$, $SE = .02$, $t = 6.77$, $p < .001$), and less strongly at high levels of task significance ($\gamma = .07$, $SE = .04$, $t = 2.04$, $p < .05$). The two-way interaction between energy and resisting distractions was not significant. Thus, Hypothesis 5c was not supported.

---Insert Figure 1 about here---

In Model 4, we examined the interaction between task attentional pull factors (time pressure, task significance) and off-task attentional demands (resisting distractions). Based on the AIC fit statistic model 4 is to be preferred to the previous models. In line with Hypothesis 6a, the interaction between time pressure and resisting distractions was significant ($\gamma = -.08$, $SE = .02$, $t = -3.65$, $p < .001$). Figure 2 illustrates this interaction effect. Contrary to expectations, simple slope analyses indicated that the relationship between resisting distractions and episodic performance was positive and significant at low levels of time pressure ($\gamma = .19$, $SE = .03$, $t = 7.22$, $p < .001$) and also at medium levels of time pressure ($\gamma = .12$, $SE = .022$, $t = 6.13$, $p < .001$), but not significant at high levels of time pressure ($\gamma = .05$, $SE = .03$, $t = 1.89$, $p = .06$). Contrary to our expectations, overall high levels of resisting distractions were related to higher episodic performance (see also Hypothesis 4), and task significance did not interact with resisting distractions. Thus, Hypotheses 6a/b were rejected.

---Insert Figure 2 about here---

Additional Analyses

In addition to within-person relationships, we modeled relationships between persons to disentangle intraindividual from interindividual effects. The results (Table 2) show that persons who experienced more energy throughout the day ($\gamma = .20$, $SE = .04$, $t = 5.51$, $p < .001$) also reported higher levels of performance. Further, persons who experienced higher task significance ($\gamma = .38$, $SE = .05$, $t = 8.21$, $p < .001$) also reported higher levels of performance. There were no differences between persons regarding the relationship between resisting distractions and performance ($\gamma = -.01$, $SE = .04$, $t = 0.14$, $p = .89$) and time pressure and performance ($\gamma = .06$, $SE = .05$, $t = 1.51$, $p = .13$).

Further, we examined the relationship between time pressure and episodic performance, which, contrary to expectations, was not significant in Models 2 to 4. We found that when task significance was not included in the model, the relationship between time pressure and episodic performance was significant ($\gamma = .09$, $SE = .02$, $t = 3.88$, $p < .001$). The same was true when resisting distractions was excluded from the model ($\gamma = .07$, $SE = .02$, $t = 3.27$, $p < .001$).

Discussion

Our study reports an empirical test of the episodic process model of performance (Beal et al., 2005) in the field. In an earlier study, Merlo et al. (2018) used positive and negative affect as indicators of regulatory resources and showed that both are related to self-reported episodic performance supporting a core mechanism of the episodic process model of performance. However, Merlo et al. (2018) tested positive and negative affect as antecedents of performance, and neglected the arousal component of affect (for studies on measuring affect, see Matthews, Jones, & Chamberlain, 1990; Schimmack & Grob, 2000; Wilhelm & Schoebi, 2007). In the present study, we were able to complement and advance previous research by using energy levels as an indicator of regulatory resources and to corroborate the direct relationship to episodic performance as postulated by Beal et al. (2005).

The core purpose of the present study, however, was not only to examine the direct relationship between energy and self-reported episodic performance, but also to test the relationship of varying environmental factors on episodic performance, namely task attentional pull factors and off-task attentional demands. With regard to task-attentional pull, the results of our study show that task significance is positively related to episodic performance. Thus, in accordance with the job characteristics model (Hackman & Oldham, 1980), our results show that meaningful tasks boost episodic performance.

The non-significant result regarding time pressure, however, is surprising. Based on the challenge-hindrance stressor framework (LePine et al., 2005; Podsakoff, LePine, & LePine, 2007), we expected that episodic time pressure would be positively related to episodic performance. According to the challenge-hindrance framework, time pressure is usually perceived as manageable and thus expected to be positively related to performance because employees invest effort to cope with this demand (LePine et al., 2005). The results of our additional analyses revealed that the relationship between time pressure and episodic performance was significant and positive if the other predictors (task significance and resisting distractions) were not simultaneously included in the model. Thus, time pressure is indeed, as expected, positively related to performance but does not emerge as a significant predictor if task significance and resisting distractions are included in the same model. Taking the significant correlations between constructs into account, the effects of the predictors on each other might indicate some underlying processes. For example, resisting distractions could be a mediator in the relationship between time pressure and episodic performance. However, investigating mediating effects is challenging when investigating effects within a performance episode.

We operationalized off-task attentional demands with the self-control demand scale that captured resisting distractions from work. We assumed that performance would be lower if off-task attentional demands were high, because they distract people's attention from the work task at hand. What we found was contrary to this proposition: If people reported a high need to resist distractions (i.e., they needed to shut themselves off from distractions in their environment), their performance was *higher* compared to when they reported a low need to resist distractions. This finding was somewhat surprising, but when looking more closely at the items we used to measure off-task attentional demands (e.g., "In order to achieve my work goals, I could not afford any distractions in the last hour"), we realized that they captured the necessity to cope with demands from the environment (see also Gaudreau, Nicholls, & Levy, 2010). Employees' perception that resisting distractions is crucial for the attainment of their performance goal in an episode may rather reflect characteristics of their work tasks during this episode than the presence of distractions during that same episode. As an anonymous reviewer pointed out, the measure we applied might assess the motivation to resist distractions, but not the degree to which one is actually resisting distractions. Therefore, we may not have measured the process of resisting distractions but the need or desire to resist them[1]. Taken these shortcomings in the measurements into account, the failure to confirm the hypothesis might reflect a measurement flaw, and therefore does not provide evidence that predictions of the episodic process model were not supported. Basically, due to our operationalization of the off-task attentional demands, Hypotheses 4, 5c, and 6 are not unambiguously tested and the results remain exploratory. Thus, we recommend that future studies which aim to put the episodic process model to the test may consider alternative/other operationalizations of off-task demands.

Support for the episodic process model of performance stems from our result of the joint effect of task significance and energy levels on episodic performance. This result highlights that varying environmental factors can function as a compensatory mechanism in preventing low energy levels from leading to low episodic performance. Accordingly, meaningful tasks increase episodic performance even when energy levels are low. However, this compensatory effect was not found for time pressure as a task attentional pull factor.

Advancing the episodic process model of performance (Beal et al., 2005), we tested the interaction between task-attentional pull factors and off-task attentional demands. We found a significant interaction between time pressure (as a task-attentional pull factor) and resisting distractions (as an off-task attentional demand). The pattern of the interaction that was not in line with our hypothesis showed that under conditions of low and medium levels of time pressure, but not under conditions of high time pressure, resisting distractions was positively related to episodic performance. We can only speculate about the meaning of this pattern of the interaction effect. A possible explanation for this pattern is that resisting distractions requires self-control effort. Without this self-control effort, the pull-effect of time pressure is visible. Thus, the pull-effect of time pressure can be counteracted if dealing with off-task attentional demands is necessary, which, although positive for episodic performance, also consumes additional regulatory resources. This suggests that a work environment characterized by challenge due to high time pressure is only beneficial for episodic performance if self-control demands are low.

In addition to within-person relationships, we used our multilevel data structure to explore these relations also on the between-person level of analysis. Our results (see Table 2) show that the relationships found on the level of performances episodes (that is, hours) were partly found on the level of the workday (between-person level). In accordance with results for episodic performance, people who reported more energy and more task significance across the workday, compared to people who reported less energy and less task significance, reported better performance across the workday. However, the positive effect of resisting distractions on episodic performance did not appear on the between-person level of analysis. That is, people who reported resisting distractions to a greater extent across the workday (compared to people who reported resisting distraction to a lesser extent) did not report better performance across the workday. In conclusion, results show that day-specific and episode-specific person and environmental factors are related to performance. Notably, the within-person result regarding resisting distractions is not replicated on the between-person level, highlighting the utility of our fine-grained approach that allowed us to capture effects specific to the level of episodes.

Implications

The results of the present study give rise to at least three important implications. First, the results of the present study supported direct relationships between energy levels, task significance, and resisting distractions and episodic performance. Therefore, establishing high performance on an episodic basis, person-oriented variables, as well as task characteristics are important. Based on previous research and in light of our findings, several measures might be helpful in sustaining energy levels and protecting performance, such as providing meaningful work tasks (Wrzesniewski & Dutton, 2001), recovery times during work, and autonomy in when to take recovery times throughout the day (Kühnel, Zacher, de Bloom, & Bledow, 2017).

Second, the results of our study show a compensatory effect of task significance on episodic performance in times of low energy levels. This suggests that switching to meaningful tasks in times of low energy may prevent a drop in episodic performance. However, when taking the time frame of our research design into consideration, we would be cautious to assume that this is indeed a beneficial long-term strategy. More research on the long-term effects of such a strategy is needed in order to rule out possible negative effects, such as the development of burnout symptoms over time (Leiter & Maslach, 2009). Measurement-burst studies (Sliwinski, 2008) which combine frequent measurements across a short time frame (e.g. one day) with measurements over longer time frames (e.g. years), may help to shed more light on this matter.

Third, in times of low energy it does not seem to help to increase the time pressure on employees as time pressure did not act as a moderator for the relationship between energy levels and episodic performance. Thus, simply adding more pressure seems not to be an advisable way to improve people's episodic performance. However, to improve confidence in such suggestions, more research is needed that sheds some light on the processes involved.

Strenghts, Limitations and Suggestions for Future Research

There have been several experimental studies on performance examining how people pursue goals (e.g., Ballard, Vancouver & Neal, 2018). But the external validity of these studies is often limited due to sample characteristics (i.e., students) and restricted possibilities to develop, manipulate and repeatedly assess constructs such as task significance in the lab. Our study complements earlier studies by testing the Beal model (2005) in employees in the real world.

A major challenge in testing the propositions of the episodic process model of performance is to provide an adequate fit between theory and empirical assessment. In the present study, we used hourly measurements over one workday to capture performance episodes closely in time of actual appearance. This has the advantage that episodic performance is assessed as a time varying fluctuating state, which aligns with the theoretical propositions of the episodic process model. The hourly time interval further had the advantage of assessing employees' performance equally for all employees. A design in which employees report the segmentation based on their own perceptions to assess the specific content of the episodes would render interpretation more difficult. Furthermore, momentary assessments reduce recall bias (Bolger, Davis, & Rafaeli, 2003; Ohly, Sonnentag, Niessen, & Zapf, 2010), which is particularly important considering energy levels. Only through a close assessment in time can we expect to unravel empirical information on mood in a particular performance episode.

Despite these strengths, our research design also provides some difficulties for testing the episodic process model. Of particular importance are the cross-sectional nature of the data and the use of self-report measures. Cross-sectional designs do not permit to draw conclusions about cause and effect. Therefore, although the episodic process model proposes a causal chain of effects (e.g. regulatory resources leading to better performance), our design does not permit us to draw a firm conclusion in this regard. That is, reverse causation cannot be ruled out (e.g. better performance leads to higher energy levels). A longitudinal design that uses a time lag and separates the independent and dependent variable would be a potential strategy to improve the data quality. However, it should be noted that the episodic process model postulates relationships *within* a performance episode. It does not, however, postulate one episode's influence on the following performance episode. Although previous research has highlighted that considering lagged relationships between consecutive performance episodes is fruitful (e.g. Syrek, Kühnel, Vahle-Hinz, & de Bloom, 2018), these relationships are not part of the episodic process model. Additionally, the model does not make assumptions about the time course of performance over the working day. Thus, in order to test the theoretical proposition of the model, research is inevitably restricted to test relations *within* a performance episode, which limits possibilities for longitudinal designs. Therefore, we see some challenges in applying a longitudinal approach for testing the propositions of the episodic process model: First, the episodic process model describes effects that unfold within a specific performance episode. Such a performance episode necessarily has a very narrow time perspective. In order to apply a longitudinal design (i.e., applying a time lag in the analyses), we would have to separate the measurement of energy levels or task attentional pull factor from the performance measurement. However, two measurement points within such a short time period is likely perceived as a burden by participants. Endeavors like ours require researchers to find a delicate balance between measurement frequency, number of items to validly assess constructs of interest, as well as participant effort and time investment to prevent (selective) attrition and non-generalizable results.

Second, in order to assess the effects within a performance episode longitudinally, participants would need to provide start and finishing times of an episode at the exact moment an episode appears. As tasks are not necessarily performed within one hour and can stretch over several hours, participants' reports of performance episodes would constitute meaningful measurement units of time. Consequently, these self-reported start and end times would ultimately result in performance episodes of different duration within and between persons (e.g., Person A completes task A between 11.30 and 12.00 and task B between 13.00 and 14.30 whereas person B completes task C between 9.15 and 10.15 and task D between 13.00 and 14.00). Hitherto, no clear guidance exists whether the duration of time lags between a measurement at the start and the end of a specific performance episode, has an effect on the relationships assessed. Put differently, although such a sampling strategy would provide time separated measurements, we would lack information about the effects of different time lags. This would make the interpretation of longitudinal effects within a specific performance episode difficult. Considering the challenge for harmonizing the theoretical propositions and the empirical assessments in studying performance episodes, simply stating that a longitudinal design is fruitful for future studies seems inappropriate. We have to consider the empirical limitations, feasibility (i.e., in terms of participant burden), and nevertheless find ways of testing the theoretical assumptions. Our study provides evidence that a relationship exists between energy levels, task significance, and episodic performance. Cross-sectional studies like ours (i.e., associating observations taken at the same measurement point; each measurement point is assumed to capture a new episode) are a good way to provide first evidence of a relationship, particularly under the condition that little is known about the best time lag that has to be considered and the challenging data acquisition (Spector, 2019). Another critical issue is the self-reported nature of our measurements. Within the short time frame of measurement in the current study, the perceptions of one construct might influence the ratings of another construct. For example, self-reported high episodic time pressure in one performance episode might yield higher self-reports of episodic performance during that same episode, because even if the task was not significantly advanced, performance is evaluated under the impression of high time pressure (e.g. it was the best that could be done). The same might hold for the relationship of self-reported episodic task significance with episodic performance. Working on significant tasks might result in a positive view of even small progress, because that little progress is deemed important. With regard to the self-reported nature of our measurements, a fruitful line of future research could be to include multiple sources of data in ecological momentary assessments to prevent perceptional overlaps and common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Certain jobs may provide opportunities to measure a person´s performance "objectively" within a pre-defined time period. For instance, speed of and correctness in picking clients´ orders at a warehouse might serve as performance indicators. In addition to self-reports, researchers may try to measure energy levels by using recordings of facial expressions or physiological indicators (e.g., blood glucose levels, heart rate variability). This approach would also render new insights—and probably raise more questions—on the level of convergence between "objective" and "subjective" measures for constructs that have hitherto mostly been investigated as idiosyncratic impressions. If these measures turn out to be valid indicators, this may open up new possibilities for very fine-grained ecological momentary assessments, because employees would not need to invest time in answering questionnaires.

Even more convincing evidence for causal relationships between energy and performance could be derived from experiments. These could involve engagement in a pre-defined and standardized task (e.g., vigilance test). Levels of time pressure could be experimentally varied (for lab studies that have done this, see Ballard et al., 2018; Ballard, Yeo, Loft, Vancouver, & Neal, 2016) and participants could repeatedly report on their level of energy. A downside of this approach would be low external validity, i.e., performance in the laboratory may be very different from performing in the field and objective individual performance indicators are limited to specific jobs.

Two additional limitations are particular important to mention: First, we used a time-based assessment of performance episodes, e.g. hourly measurements. This time-based assessment is supported by a study from Merlo et al. (2018), who empirically show that an hourly assessment is suitable to assess performance episodes within a workday. However, although our hourly assessment is a good approximation to assess performance episodes, they do not necessarily assess "behavioral segments that are thematically organized around organizationally relevant goals or objectives" (Beal et al., 2005, 1055). As a next step, studies investigating the propositions of the episodic process model could be improved by using retrospective reports and have employees segment their working day and performance episodes themselves, and then matching this information with hourly assessments of performance over the working day.

Second, we operationalized off-task attentional demand with items measuring the degree to which employees had to resist distractions arising from off-task concerns. Looking at the pattern of the results and the post-hoc explanations offered above, it seems that in future research, off-task attentional demands should be assessed in alternative ways. For instance as actual distractions ("I was interrupted by a colleague") rather than the way employees deal with distractions ("My work required me to ignore distractions") or attractive distractions in the environment (e.g., colleagues initiating social interactions or friends initiating pleasant contact via social media, see for example, Syrek et al., 2018).

Conclusion

As a significant amount of variance in performance resides within-person, the aim of our study was to identify factors related to self-reported episodic performance. Deriving our hypotheses from the episodic process model (Beal et al., 2005) and thus conducting a direct empirical test of this theoretical model, we examined the relationship between task significance, time pressure (i.e. task attentional pull) and the perceived need to resist distractions (i.e. off-task attentional demands) with episodic performance. We analyzed direct as well as joint effects. In sum, the results showed that the episodic process model explains variability within persons in performance across the working day. Our findings also shed light on the relationship between regulatory resources and employees' performance, underlining the key role of energy at work.

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Figures & Tables

Table 1
Means, Standard Deviations, and Correlations between Study Variables

	M	*SD*	2	3	4	5	6	7
1 Gender	1.52	.50	-.06	-.20**	-.08	.01	-.04	.03
2 Age	35.07	12.34		.16**	.22**	.19**	.26**	.15**
3 Energy	3.39	.75			.11*	.29**	.13*	.38***
4 Time pressure	2.33	.87		.05*		.45**	.60**	.32***
5 Task significance	3.41	.72		.16***	.40***		.58**	.55***
6 Resisting distractions	2.80	.81		.07**	.49***	.47***		.31***
7 Performance	3.50	.60		.16***	.20***	.38***	.29***	

Note. Correlations below the diagonal are hour-level correlations (*N* = 2078), correlations above the diagonal are person-level correlations (*N* = 330). *** $p < .001$, ** $p < .01$, * $p < .05$.

Table 2

	Model 1 (self-regulation of attention)				*Model 2 (task attentional pull, off-task attentional demands)*				*Model 3 (interactions involving energy)*				*Model 4 (interactions involving dealing with distractions)*			
	Est	*SE*	*t*		*Est*	*SE*	*T*		*Est*	*SE*	*t*		*Est*	*SE*	*t*	
Intercept	3.36	0.05	70.46	***	3.40	0.04	82.23	***	3.40	0.04	81.97	***	3.43	0.04	82.15	***
Time linear	0.03	0.01	3.95	***	0.02	0.01	3.19	**	0.02	0.01	3.24	**	0.02	0.01	3.29	**
Energy^{w}	0.24	0.03	9.07	***	0.16	0.02	7.00	***	0.15	0.02	6.77	***	0.15	0.02	6.82	***
Time pressure^{w}					0.01	0.02	0.58		0.02	0.02	0.67		0.03	0.02	1.11	
Task sig. ^{w}					0.32	0.02	16.43	***	0.32	0.02	16.53	***	0.31	0.02	15.90	***
Resisting distractions^{w}					0.14	0.02	6.71	***	0.13	0.02	6.41	***	0.12	0.02	6.12	***
Energy^{w}*Time pressure^{w}									0.03	0.03	1.01		0.04	0.03	1.20	
Energy^{w}*Task significance^{w}									-0.10	0.03	-3.45	***	-0.10	0.03	-3.40	***
Energy^{w}* Resisting distractions^{w}									0.05	0.03	1.67		0.05	0.03	1.78	
Time pressure^{w}* Resisting distractions^{w}													-0.08	0.02	-3.65	***
Task significance^{w}* Resisting distractions^{w}													-0.02	0.02	-1.18	
Energy^{b}	0.31	0.04	7.52	***	0.20	0.04	5.51	***	0.20	0.04	5.53	***	0.21	0.04	5.56	***
Time pressure^{b}					0.06	0.05	1.52		0.06	0.04	1.53		0.07	0.04	1.76	

Task significance[b]		0.38	0.05	8.21	***	0.38	0.05	8.19	***	0.38	0.05	8.13	***
Resisting distractions[b]		-0.01	0.04	-0.14		-0.01	0.04	-0.17		-0.01	0.04	-0.15	
Level-1 intercept variance (SD)	.59 (.77)	.45 (.66)				.45 (.68)				.44 (.66)			
Level-2 intercept variance (SD)	.15 (.39)	.11 (.33)				.11 (.32)				.11 (.33)			
Δ Pseudo R^2 (Level 1)	.14	.28				.28				.28			
BIC	5068.05	4530.68				4530.68				4555.50			
AIC	5028.59	4457.44				4457.44				4454.13			

Multilevel Analyses Predicting Performance

Note. *** $p < .001$, ** $p < .01$, * $p < .05$. Between = compositional effect.

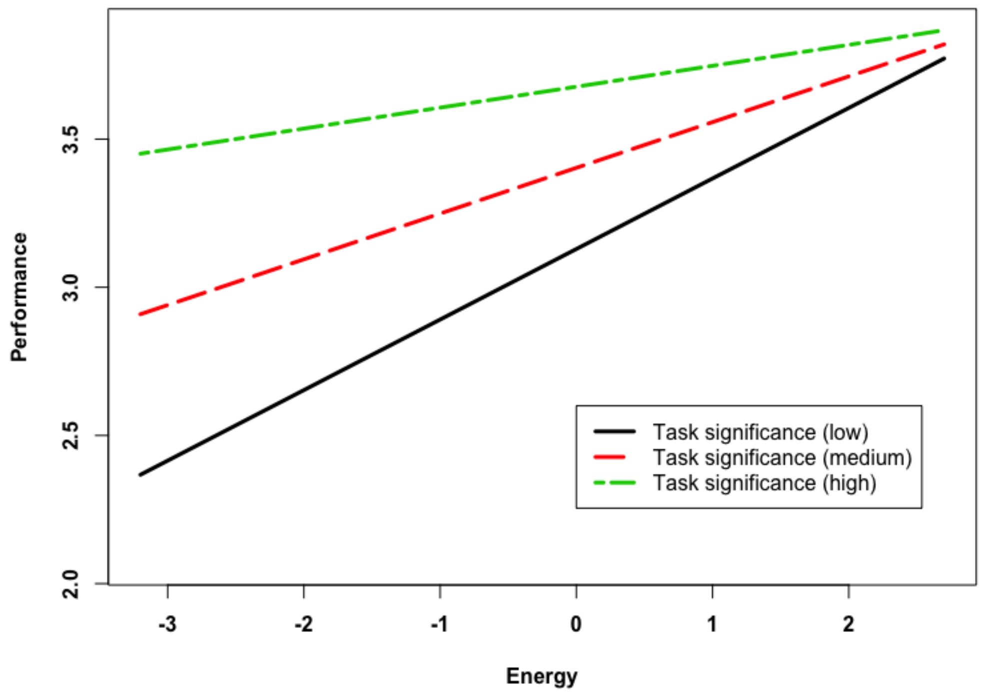
Performance
2.0
2.5
3.0
3.5
-3
-2
-1
0
1
2
Energy
Task significance (low)
Task significance (medium)
Task significance (high)

Figure 1. *Level-1 Interaction between energy (min, max) and task significance (high = + 1 SD, medium = M, low = -1 SD).*

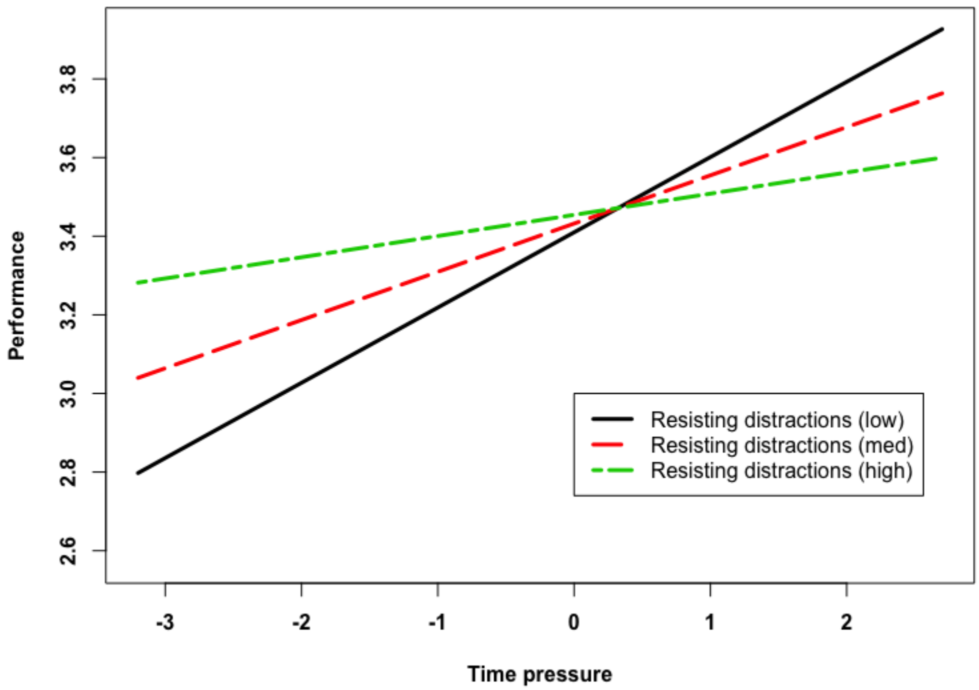

Figure 2. *Level-1 Interaction between resisting distractions (high = + 1 SD, medium = M, low = -1 SD) and time pressure (min, max).*

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