

THE ECONOMIC EVALUATION OF TIME CAN CAUSE STRESS

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Psychological stress can cause decreases in well-being, increases in disease, and faster cellular death. Because the workplace is one prominent source of stress, it is both practically and theoretically useful to comprehensively understand which workplace practices may be stress inducing. In two experiments, we found that people nudged to be in an “economic mind-set” (who thought of time in terms of money while working on a realistic “at work” task) self-reported higher levels of psychological stress (Experiments 1 and 2) and also evidenced more physiological stress—levels of salivary cortisol were 23.53 percent higher (Experiment 2)—compared with participants whose monetary value of time was not made chronically salient. We suggest several possible mechanisms through which the economic evaluation of time (EET) may cause stress. A commodified view of time can increase impatience and make someone feel pressured to “use time wisely.” And thinking of time like money can diminish the meaning of a person’s work and psychological attachment to the job, thereby making tasks more stressful. Thus, increasingly common work arrangements that commodify time may increase stress.

Stress is killing us. And the workplace is one prominent source of chronic stress. For decades, research has demonstrated the adverse health effects of stress (Reed & Raison, 2016). Based on decades of

empirical studies of stress, Cohen, Gianaros, and Manuck (2016) have proposed a stage model of stress and disease, where stressful events trigger internal affective phenomena and emotional states that in

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turn produce behavioral and biological responses that are potentially connected to ill health.

Evidence suggests the workplace may be among the most prominent sources of stress in our lives. The health website WebMD reported that work stress was the number one source of stress, with almost half of all U.S. workers experiencing work-related stress and one-quarter of respondents claiming that the workplace was their single biggest source of stress (WebMD, 2015). In 2017, the American Psychological Association published a report entitled “Stress in America.” Of the four most significant causes of stress highlighted in that report, money and work were ranked 2 and 3 in importance (APA, 2017). In a national survey conducted in Australia, 30 percent of respondents cited the workplace as a source of stress (Casey & Mathews, 2011).

Extensive prior research has identified numerous causes of workplace-induced stress and adverse effects of that stress on health ranging from work–family conflict (Boles, Johnston, & Hair, 1997; Chiang, Birtch, & Kwan, 2010; Frone, Russell, & Cooper, 1997; Hobson, Delunas, & Kesic, 2001) to economic insecurity (Dooley & Catalano, 1984; Dooley, Catalano, & Rook, 1988; Hamilton, Broman, Hoffman, & Renner, 1990; Strully, 2009) to an absence of job control (Carayon, 1993; Cherns, 1976; Frese, 1989; Karasek, 1979; Knight & Haslam, 2010; Marmot, Rose, Shipley, & Hamilton, 1978). The discovery reported in this article adds another possible source of stress to this list: the economic evaluation of time (EET)—thinking of time like money.

Workplace-induced stress and its effects on health are important for several reasons. First, health-care costs are a significant burden on both society and employers. For instance, there is evidence that rising health-care costs have virtually wiped out gains in income for many U.S. families (Auerbach & Kellermann, 2011) and the average cost for health insurance benefits in the private sector represented 11.6 percent of total compensation (Bureau of Labor Statistics, 2017). Although not the case today, at one time, automakers spent more on health care than on steel and General Motors spent more on health care than it did on advertising (Appleby & Carty, 2005).

Second, research shows that, not surprisingly, employee health affects productivity (Mattke, et al., 2007; Schultz & Edington, 2007). And third, people’s health status provides a marker or indicator of how well a social system is functioning. Pfeffer (2010) argued that the health status of an organization’s workforce was a measure of human sustainability, and Marmot (2004: 247) commented: “Health functions as a kind of social accountant. If health suffers, it tells us that human needs are not being met.” We should, therefore be concerned

about the link between workplace practices and health both because of the demonstrated effects on economic outcomes such as productivity and profit and also because health is one indicator of and an important cause of well-being (Centers for Disease Control, 2016).

Although how someone is paid is obviously an important part of people’s work environments, there has been surprisingly little prior research on how pay practices affect stress. What little research there is has focused on performance-based pay. A study in Taiwan (Yeh, Cheng, & Chen, 2009) found that people subject to performance-based pay worked the longest hours and reported the highest levels of stress. A review of the literature (Ganster, Kierasch, Marsh, & Bowen, 2011) found that various performance-based pay arrangements such as piece rates were associated with increases in both psychological and physiological stress and called for more study of the effects of various reward systems on stress.

Research on hourly pay suggests another dimension of pay practices that warrants exploration as a source of stress. Being paid by the hour makes the EET salient (Pfeffer & DeVoe, 2012) as does accounting for one’s time on a time sheet (DeVoe & Pfeffer, 2010). Hourly pay and billing systems are commonplace (DeVoe & Pfeffer, 2007b) and span the socioeconomic status hierarchy including hourly payment for retail clerks and production workers to billing time to clients and projects for lawyers (Kaveny, 2001) and consultants (Yakura, 2001). Empirical findings suggest that practices that induce people to think of time like money are psychologically consequential. For example, DeVoe and Pfeffer (2007b) found that people paid by the hour or those who calculated their hourly wage were more likely than others to be interested in trading off time for money—to work more. DeVoe and Pfeffer (2007a) reported that hourly paid people and those who calculated their hourly wage were less interested in volunteering their time, as were those who billed their time on a time sheet (DeVoe & Pfeffer, 2010). Whillans and Dunn (2015) reported that people paid by the hour were less likely to engage in prosocial environmental behavior. And perhaps most central to the present research, DeVoe and House (2012) experimentally demonstrated that priming people to think of their time as money reduced the pleasure experienced while spending leisure time.

These findings suggest that it is reasonable to expect that practices that make the link between time and money salient might create an uncomfortable, if not stressful, experience. Thus, in this article, we explored the possibility that *how* people are paid, and specifically the extent to which the time–money connection is salient, will affect their experienced stress.

Author's voice:

What motivated you personally to undertake this research? Why is it important to you?



Author's voice:

How did the paper evolve and change as you worked on it?



In the two experiments reported here, we examine a previously neglected but plausibly impactful contributor to workplace stress: a commodified view of time—in other words, viewing every increment of time as an increment of money. It is important to recognize that as Hamermesh (2002) noted, the proportion of the U.S. workforce paid by the hour has recently increased. And ever more professions such as doctors and accountants confront cost-based demands to use their time as efficiently as possible and chronically face reminders of the economic value of their time. These studies provide the first empirical demonstration that merely making the economic value of a person's time salient can cause psychological and physiological stress.

WORKPLACE-INDUCED STRESS AND THE COMMERCIALIZATION OF TIME

In the psychological and physiological literatures, a stressor is defined as a psychological or physical insult. When a person perceives the demands of a situation to exceed his or her own psychological, emotional, physical, or intellectual resources, the mind makes sense of this discrepancy by appraising it as a threat (Tomaka, Blascovich, Kibler, & Ernst, 1997). A perceived threat can then launch a stress response, which is often accompanied by self-reported stress, anxiety, and feelings of being out of control (Kudielka, Schommer, Hellhammer, & Kirschbaum, 2004). If the stress response is strong enough, the result is often elevated cortisol levels (for a review, see Dickerson & Kemeny, 2004), which is why we wanted to measure cortisol reactivity in one of the reported studies. Cortisol is the end product of an HPA (hypothalamic-pituitary-adrenal) axis response to a real or imagined stressor.² Cortisol is a catabolic (i.e., cell “breaking-down”) hormone with links to chronic stress, systemic inflammation, accelerated cellular death, and generally poor health (Cohen, Doyle, Turner, Alper, & Skoner, 2003; Epel et al., 2004; Seeman, 1997; Segerstrom & Miller, 2004; Shivpuri, Gallo, Crouse, & Allison, 2012). Although cortisol is part of an adaptive system supporting mobilization—especially in the face of a threat—chronically elevated or poorly regulated cortisol can be detrimental to health.

² These organs are a major neuroendocrine system that affects reactions to stress.

Experiment 1: Overview

As a first exploration of the connection between a commodified view of time, and before bearing the considerable expense of assaying saliva for cortisol, Experiment 1 manipulated the salience of the time–money connection and examined the effect of an economic (versus a control) mind-set on a multi-item measure of self-reported stress.

To manipulate economic mind-set, half of the participants were asked to calculate their likely future hourly wage. The participants in the control condition just reported their likely yearly income and number of hours likely worked each week. Thus, participants in both conditions were thinking about both money and time but only in the economic mind-set condition did participants do a *calculation that would cause them to commodify time* by determining precisely how much money each hour of their time would be worth. It is worth highlighting that everyone was asked a question about money—their likely yearly income. This is important because there is evidence that merely thinking about money has important psychological consequences (Vohs, Mead, & Goode, 2006). Following the manipulation, participants engaged in a managerial task for 20 minutes that has been used previously (DeVoe & Pfeffer, 2010; Lee & Tiedens, 2001). Two short “break times” were enjoyed by the participants to simulate a work experience. After each 3-minute “break,” participants answered questions about their experiences. The measure of self-reported stress was taken at the beginning and the end of the experiment and participants also reported their perceptions of an objectively pleasant task (i.e., looking at art) during their break.

We expected that experiencing the economic mind-set of “time is money” would increase self-reported stress during a work-like experience. In what follows we report all subject exclusions, data analyzed, covariates, conditions manipulated, and in the footnotes, we list any additional measurements that were taken but not analyzed. The accompanying Online Supplemental Materials also contains additional methodological information.

Method.

Participants and design. Fifty-two participants (71 percent identified as female and the rest as male) participated in a 30-minute experiment for \$10. Thirty-nine were of Asian descent, nine Caucasian, two Black, three Hispanic, two Indian American, and

two identified as “some other race/ethnicity or combination.” Five additional participants (not included in $N = 52$) were removed from all analyses *a priori* because of notes made in the experimenter log which noted irregularities such as the computer program needing to be restarted or the person’s stated future income being an outlier greater than 3 SDs above the mean such as \$400,000 per hour. Sample size was determined by running two sessions in an economics computer laboratory with the goal of achieving 30 participants per experimental condition. Each session has the maximum capacity of 36 participants. Both sessions ran and data collection stopped at the pre-chosen time. Participants across the two experimental sessions were randomly assigned, by a computer program, to either be in the “EET” or the “control” condition. The experimenters were blind to hypothesis and experimental condition.

Experimental procedure. The entire procedure lasted approximately 30 minutes. The first task participants completed after signing the consent form was a 16-item measure of stress which included self-reported experiences of a number of emotions related to feeling stressed, feeling a lack of stress, and feeling relaxed. This same 16-item measure was completed again at the very end of the experiment. After answering a number of questions about future income, future hours and days worked, food items consumed each day (on average), and approximate price of each food item, participants in the EET condition were asked to calculate their likely *future hourly wage* with the information just provided. Participants in the control condition were also asked to calculate something, only these participants calculated the *average cost of a future consumed daily food item*. This method departs from much previous research using EET manipulations in that in past research, only the EET participants were asked to do math, whereas those in the control condition were not (although DeVoe & House, 2012, in one of their experiments, did have participants in the control condition do some mathematical calculations unrelated to hourly income). Here, both the experimental and control participants did mathematical calculations to provide an equivalent cognitive load for both groups—the only difference is that the experimental condition’s EET participants’ math was expected to put participants into a mind-set in which the EET was salient.

Immediately after the experimental manipulation, participants engaged in a managerial task in which they were asked to make personnel decisions for approximately 20 minutes. The task was modeled after DeVoe and Pfeffer (2010) and Lee and Tiedens (2001).

FIGURE 1
Four Sample Images Viewed in Experiment 1
(Taken from Google Images and Covered Under the Fair Use Act)



Participants had many materials, including file folders, resumes, and rating sheets (materials were adapted from a business school case called “Grogan Air” by Ames, 2008), with which to complete their work for a fictitious company called the “Jarna Corporation.” Participants made these decisions alone. Participants paused for two brief breaks during the 20-minute personnel decision work. During these breaks, participants were instructed to take a break from work and to enjoy some artwork. During two and a half minute breaks taken twice (spaced equally throughout the 20-minute personnel decision work), participants viewed pieces of modernist non-copyrighted images of Picasso-esque art taken from Google images (see examples in Figure 1). A total of 10 pictures were shown, five during each break. At the end of the 20-minute personnel decision task and a total of 5 minutes of break time, participants completed the 16-item self-reported stress measure a second time.

Self-reported stress. The self-reported experience of stress is a well-established and validated method of measuring stress in an experimental context, in part because any demand characteristics of the experiment would be to report just the opposite—that the participant feels fine. There is substantial evidence that stress is validly and reliably measured with self-report items (Andreou et al., 2011; Cohen, Kamarck, & Mermelstein, 1983). The 16 stress-relevant items were taken from the Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988). Participants responded to 16 items on a 5-point scale from 1 (*not at all*) to 5 (*extremely*). Items were both high arousal and/or negative and low arousal and/or positive. “Negative” items were afraid, anxious, nervous, panicky, scared, shaky, stressed, upset, and worried; “Positive” items were at ease, bored, calm, content, fearless, relaxed, and tired (pretest $\alpha = 0.88$; posttest $\alpha = 0.87$).

Self-reported experiences of break time. Four questions assessed participants’ experience immediately after each of the two breaks. All questions were asked on a 1 (*not at all*) to 5 (*extremely*) scale. Questions were (1) How relaxed are you while

viewing the artwork? (2) How much are you enjoying this experience? (3) How beautiful are these pieces of art? (4) How much more time (in minutes) would you be willing to spend on this activity?³

Results and discussion.

Does an economic mind-set cause stress? Experiment 1 tested the effect of an economic mind-set on self-reported stress. A commonly used difference score approach was used to examine changes in self-reported stress. Time 1 stress feelings (pretest) were subtracted from Time 2 stress feelings (posttest). Data were analyzed in several ways. The first analytical approach reverse scored positive items to create a composite negative stress index. Note that this measure of increased stress implicitly controls for individual differences in self-reported stress because baseline levels of self-reported stress that participants walked in the door with are subtracted out. This analysis demonstrated that individuals in the control condition reported less psychological stress ($M = -0.09$; $SD = 0.19$) than those in the economic mind-set condition ($M = 0.05$; $SD = 0.30$), $F_{(1, 50)} = 4.14$, $p < .047$, effect size $r = 0.275$.

Another analysis entailed separating self-reported positive and negative emotion to examine the effects more closely. Participants who were working on the personnel task while in an economic mind-set were significantly more stressed and less relaxed than those in the control condition. Figure 2 illustrates the

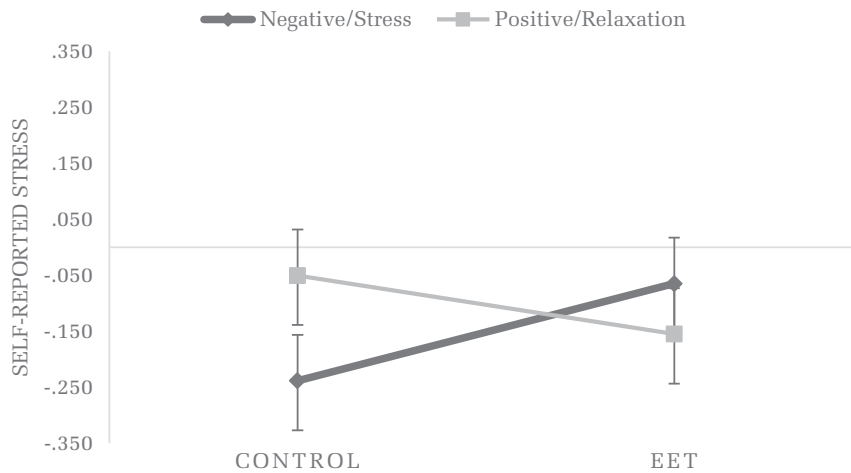
interaction between self-reported experience of both high arousal and/or negative (stress) and low arousal and/or positive (relaxation) emotion for the participants in both the EET and control condition. To test the interaction, a 2×2 mixed-model analysis of variance (ANOVA) with stress as the repeated measure (negative/arousal and positive/relaxation) and experimental condition as the between-participants factor was statistically significant, $F_{(1, 50)} = 4.14$, $p < 0.05$, effect size $r = 0.28$ (note: these results are identical to the difference score results presented previously). The 95 percent confidence intervals (CIs) for the negative/stress variable in the control condition were -0.40 and -0.07 and in the EET condition were -0.24 and 0.11 . For the positive/relaxation variable in the control condition, they were -0.22 and 0.11 and for the EET condition -0.33 and 0.02 .

Because there have been critiques questioning the use of difference scores (Johns, 1981; Peter, Churchill, & Brown, 1993; but see Overall & Woodward, 1975), we also used a regression model to analyze the data in which the outcome variable was the interaction term between positive affect and stressful affect. The model included the main effect of condition and the interaction terms between each positive affect and condition and negative affect and condition. Consistent with the ANOVA results mentioned previously, the main effect of condition was a significant predictor of the positive \times negative interaction term in the manner depicted in Figure 2, $\beta = 0.50$, $t = 3.38$, $p < .001$.

In addition to the difference score approach and the interaction results presented in Figure 2, we also performed regression analyses using time 2 measures as the dependent variables, with time 1 measures included as predictors along with experimental condition. To do this, a single “negative stress” variable was constructed in which the positive items were reverse-scored and averaged with the negative items. Largely consistent with the difference score approach, after controlling for initial levels of stress specific to the individual participant, participants induced to think of time as money exhibited higher levels of psychological stress ($M = 1.78$; $SD = 0.36$) than those not induced to think of time as money ($M = 1.68$; $SD = 0.26$), $F_{(1, 49)} = 3.89$, $p < .054$. Additional regression analyses were performed to test whether initial levels of stress moderated the time–money manipulation’s effect on the outcome stress measure—it did not: $\beta = 0.213$, $t = 1.16$, $p > .52$. However, as is typically the case, Time 1 (i.e., baseline individual differences) stress was positively related to time 2 stress, $\beta = 0.56$, $t = 3.75$, $p < .001$. The possibility of quadratic and cubic effects was also tested in linear regression, but there were no effects (all $ps > .23$).

³ *Additional Measures not Analyzed in Experiment 1.* Participants also completed a self-report measure of powerful feelings at the very end of the experiment along with two hypothetical scenarios that comprise “The Trolley Problem.” Both were included only because the Media Lab program used for this experiment was recycled from a previous experiment and these items were left in unintentionally—we did not intend to measure either and because they came at the very end (right before debriefing) neither had the ability to influence any results. For purposes of complete reporting, the power items were each answered on a 5-point scale from 1 (*not at all*) to 5 (*extremely*) and were I feel powerful, I feel in control, I feel in charge, and I feel full of control. The trolley problem asks for a yes/no response to each of the following two scenarios: Scenario 1: A trolley is running out of control down a track. In its path are five people who have been tied to the track. Fortunately, you can flip a switch, which will lead the trolley down a different track to safety. Unfortunately, there is a single person tied to that track. Should you flip the switch? Scenario 2: As before, a trolley is hurtling down a track toward five people. You are on a bridge under which it will pass, and you can stop it by dropping a heavy weight in front of it. As it happens, there is a very fat man next to you—your only way to stop the trolley is to push him over the bridge and onto the track, killing him to save five. Should you proceed?

FIGURE 2
Interaction Between Economic Mind-Set and Self-Reported Stress. Error Bars Are Standard Errors



Did those in an economic mind-set experience break time differently from others? Contrary to the findings of DeVoe and House (2012), there were no main effects of being in an EET mind-set versus being in the control condition on participants' psychological experience during the break time. However, there was an interaction between perceived beauty of the artwork and how much more time participants were willing to spend enjoying it. Previous research has tested how pleasant the break experience was. We explored a related but different effect: the relationship between the perceived beauty of the viewed artwork and people's willingness to spend time on the experience. We found that participants in the control condition thought the artwork was less

beautiful, but they also wished they had more time to enjoy it. However, when in an economic mind-set, people judged the artwork as more beautiful, but participants were less willing to spend any more time on the activity regardless of how beautiful they perceived it to be. A mixed-model 2 (EET vs. control—between participants) \times 2 (enjoy beauty vs. spend time—within participants) ANOVA revealed a statistically significant interaction, $F_{(1, 48)} = 4.14$, $p < .05$; effect size $r = 0.28$ (Figure 3). The 95 percent CIs for the variable “enjoy beauty” was -0.61 and 0.11 in the control condition and -0.22 , 0.57 in the EET condition. For the variable “willing to spend more time,” they were -0.24 and 0.53 in the control condition and -0.59 and 0.24 in the EET condition.

FIGURE 3
Interaction Between Enjoying Artwork as Beautiful and Willing to Spend More Time. Error Bars are Standard Errors



These findings are consistent with an earlier theme in the economic mind-set literature, namely, that inducing an economic evaluation of people's time influences their decisions and preferences in ways that cause them to not do things they seemingly prefer or like.

Discussion. Consistent with our expectations, being in an economic mind-set, where the economic value of time was salient, caused participants to self-report feeling more stress. Although the self-reported perception of stress is a reliable and valid indicator of people's psychological experience of stress, it is only modestly correlated with measures of physiological stress (Schneider, 2004). And although important because perceived stress (whether objectively present or not) *can* cause a threat response, perceived stress does not always cause a threat response as we have developed many psychological coping mechanisms to mitigate against perceived stressors—especially when we can distract ourselves with work, as is the case here. It is the physiological stress response itself that is most directly linked to psychological disorders and physical health problems, not the least of which includes clinical depression, premature aging, cellular death, and a shorter life span (Cohen et al., 2003; Epel et al., 2004; Segerstrom & Miller, 2004; Shivpuri et al., 2012). Thus, the goal of Experiment 2 was to replicate the finding that an economic mind-set causes changes in self-reported stress and, more importantly, to extend this finding by testing the most commonly measured index of the physiological stress response—cortisol reactivity.

Experiment 2: Overview

The goal of Experiment 2 was to test the replicability and generalizability of Experiment 1 to a different but conceptually similar paradigm and a broader set of outcome measures. Again, the expectation was that when the mind-set “time is money” is salient for workers, they experience more stress. Here, the effect of an economic mind-set was tested both on self-reported perceptions of stress and also on cortisol reactivity. The sample size in Experiment 2 was increased because all effects in Experiment 1 were just barely statistically significant and to be sure the effect was real, the sample size was doubled for Experiment 2. We ran four sessions in an experimental laboratory with 36 cubicles per session with the goal of collecting 144 participants. Not all participants showed up to all sessions; therefore, we fell short of the preplanned sample size but still reached the goal of doubling the sample size from Experiment 1. We report all subject exclusions, data analyzed, covariates, conditions manipulated, and

in the footnotes, we list any additional measures that were taken but not analyzed. The accompanying Online Supplemental Materials contains additional methodological information not contained elsewhere in this article.

Methods.

Participants and design. One hundred and four participants (69 percent female) were paid for 2 hours of their time while working for a fictitious company. Fifty subjects were randomly assigned to the “economic mind-set” condition and 54 to the “no economic mind-set” condition.⁴ Ethnicities were 67 of Asian descent, 15 white/Caucasian, 5 Latino/a, 3 African American or Black, 1 Hawaiian/Pacific Islander, 1 Middle Eastern, and 12 of mixed heritage or some other race/ethnicity. Because of the expense of the study, four sessions with a maximum of 36 participants per session were run. Consequently, at minimum, we would collect 100 useable participants which the power analysis suggested was a good number of participants to find an effect if, indeed, one exists setting power to 0.85 and effect size r to 0.30 (based on the observed effect size of $r = 0.28$ in Experiment 1) in a two-groups design.

Experimental procedure. In addition to attempting a replication of the self-report stress results from Experiment 1, the primary goal of Experiment 2 was to test whether a time-is-money mind-set would cause a stronger physiological stress reaction to a simulated “workday” than would a control condition. Salivary cortisol served as the index of physiological stress. To develop an experimental paradigm with the hope of shifting cortisol as a function of mind-set, the stakes needed to be high and participants needed to feel like what they were doing was being socially evaluated, important,

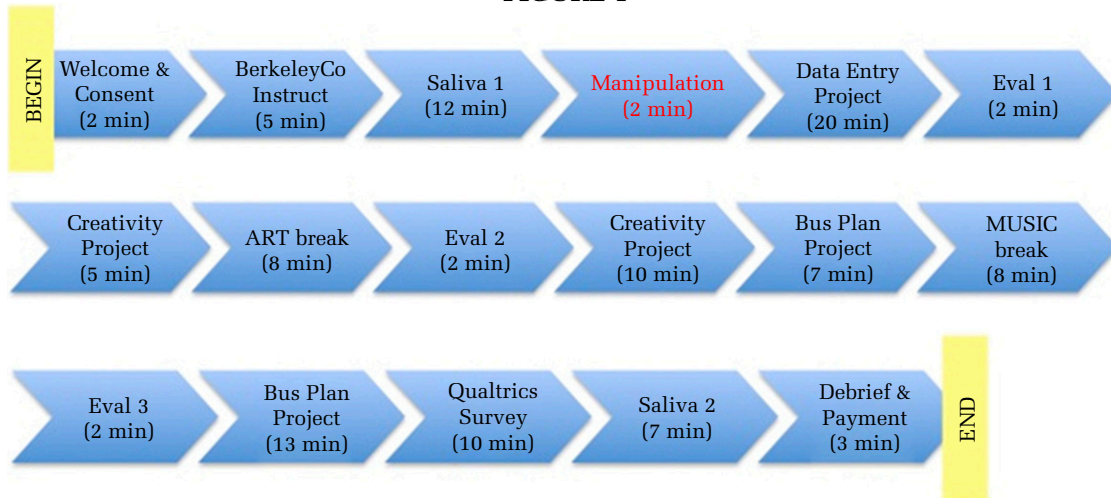
Author's voice:

What was the most difficult or challenging aspect of this research project and paper?



⁴ Twenty-eight subjects explicitly indicated they considered the 2-hour Ugandan Entrepreneurship workday to be “a total waste of time.” The remaining 104 subjects found the 2-hour experiment to be “at least somewhat important.” As explained in detail in the procedure section, the experiment looking at a stress reaction required that stakes be high (Dickerson & Kemeny, 2004). Thus, only those participants at least modestly committed to the experience were analyzed. The criterion that participants be “modestly committed” was determined a priori and is entirely why the question was asked.

FIGURE 4



useful, and otherwise diagnostic of their competence and abilities (Dickerson & Kemeny, 2004). To accomplish this, *participants were asked to help starving children in Africa—literally*. A 2-hour session was advertised as a simulated workday for which participants would be paid \$57.50 for their time (the odd number was chosen so that participants would not automatically calculate how much money they would make per hour). After arriving at the laboratory, participants were asked to help a professor with research in Africa. It was explained to participants that the researchers conducting the study were interested in entrepreneurship in emerging markets around the world, specifically in Uganda, Africa. The participants were shown photos of one of the researchers in Africa doing the entrepreneurship research described. The professor, blind to experimental condition (but not hypothesis), delivered the first 5 minutes of the experimental instructions and then left before any manipulations took place. The sole purpose of the professor's presence was to underscore how important and real this research was so that stakes would feel high, the work important, and the work reflective of competence and ability for the participants so that it would be plausible to observe shifts in cortisol reactivity (Dickerson & Kemeny, 2004).

Participants were told that they had been hired by a fictitious company to help develop entrepreneurial ideas to be used in Uganda. To facilitate creativity, participants were told they would have the option at the end of the experiment to indicate whether or not they would like their ideas to be used. And then, as promised, they were asked to indicate use preference (some did, in fact, say no). The 2-hour workday was split into three different tasks and two breaks. After arriving at the laboratory, participants signed the consent form, relaxed for approximately 8 minutes while the researchers set up the experiment (this was

built in to allow a total of 15 minutes of laboratory time to pass to return participants to their physiological baseline before the initial baseline saliva sample was collected). Participants then received general instructions from the professor, then the experimenter, and provided their first of two saliva samples.⁵ No cover story was provided for the collection of saliva. The online sign-up form that students use to volunteer to participate in experiments noted that “saliva samples will be taken during the experiment.” And the consent form that subjects signed stated, “you will also provide two small saliva samples by ‘spitting’ into a tube. We will be looking at cortisol, an ‘energy hormone’ by sending your saliva out for analysis.” In the section on “benefits,” the consent form stated, “There is no direct benefit to you from taking part in this study. . . .we hope to be able to shed light on the relationship between physiology and decision making. We are also hoping to help science understand some physiological processes associated with human judgment.” Because both the experimental and control groups received the same instructions and provided saliva, it is unlikely that providing the saliva samples affected people's perceived stress. Figure 4 shows a graphical representation of the temporal flow of the 2-hour study, indicating when various tasks were completed and saliva samples taken.

The EET manipulation was conducted on a sheet of paper and the experimenter was blind to condition to reduce the possibility of experimenter expectancy

⁵ When salivary hormones are measured, the moment the sample is produced actually references a time point 20–30 minutes earlier. This is how long it takes cortisol to be released and then metabolized to the point that it is available to be measured in saliva. Collecting blood allows for significantly shorter time lag but it is much more invasive.

effects. Participants then completed three tasks with two breaks in between the tasks, provided the second of two saliva samples, completed some self-report measures of stress, were debriefed and finally paid for their 2-hour workday.

Economic mind-set manipulation. After an extensive introduction to the experiment by both a professor and the experimenter, and after appealing to participants' empathy for those suffering in Africa, we manipulated whether participants *commodified time or not*. In the economic mind-set condition, participants were handed a slip of paper referred to as their payment statement and told to read it carefully and follow the instructions so they could be paid in 2 hours. In the economic mind-set condition, the instructions read, "Today you can make a salary of up to \$57.50. But, this will be based on the number of minutes you spend working. You will be paid at the end of the day with a check. Think of the various activities you will do today, breaks, and so on. Also, we would like you to do the following: Given your best guess of how the professor and her colleagues described your typical workday today, how many **minutes** in total do you think you will spend actually working today? **To guide your estimate of how many minutes you will spend working, you will be here for a total of 120 minutes. Please divide \$57.50/number of minutes you think you will spend working on the calculator. Press enter to see the amount of money you will make per minute—this is your per minute rate of pay. Remember that you will be paid this amount for every minute you spend working.**"

In the control condition, participants read "Today you will make a salary of \$57.50. You will be paid at the end of the day with a check. Think of the various activities you will do today, breaks, and so on. Also, we would like you to do the following: Given your best guess of how the professor and her colleagues described your typical workday today, how many **minutes** in total do you think you will spend actually working today? **To guide your estimate of how many minutes you will spend working, you will be here for a total of 120 minutes.**" Note that in the EET condition the amount of money made per minute is calculated and salient. In the control condition it is not. All other information was held constant. At two additional times during the experiment, participants received a "booster shot" of the manipulation so that the EET mind-set was salient and read on the computer either an economic mind-set prime: "Remember that you are getting paid per every minute spent working today and that the stakes are high and this is real—we are trying to help people in Uganda" or a control prime:

"Remember that you are getting paid \$57.50 today and that the stakes are high and this is real—we are trying to help people in Uganda."

The laboratory where this experiment was run does not permit deception. The recruitment form clearly specifies the pay for participation as being \$57.50. It also specifies the duration of the experiment as being 120 minutes. Because all participants know that the behavioral laboratory where the experiments were run does not permit deception, every person coming to the study knew that they would be there for 2 hours and would earn exactly \$57.50. It is important to note that all participants received the same amount of money for their participation and did the same set of activities, and also in both the experimental and control conditions, people were reminded of the total amount of money they would earn from their participation. Therefore, the only difference between the two groups of participants is the salience of their pay per minute—how much they earn per unit of time.

Physiological stress response. To measure the physiological stress response, standard salivary hormone collection procedures were used (Kirschbaum & Hellhammer, 1994; Schultheiss & Stanton, 2009). A detailed description of the cortisol measurement is provided in the Online Supplemental Materials. Salivary cortisol was assessed at two points in time. Time 1 was 15 minutes after arriving at the simulated work environment and after which subjects had an opportunity to let their bodies reach a homeostatic baseline. Time 2 was toward the end of the 2-hour session after the participants had been working on a number of tasks while either: (a) in an economic mind-set or (b) not in an economic mind-set. The average time between time 1 and time 2 was 96.38 minutes (between 92 and 98 minutes; $SD = 1.19$ minutes). Intra-assay coefficients of variation were in an acceptable range with the coefficient of variation at time 1 = 5.02 and 8.89 for time 2. The determination of the final usable sample is described in the Online Supplemental Materials. We had 43 participants in the economic mind-set condition and 50 participants in the control condition for cortisol analysis.

Almost all participants complied with the requirement to not eat, drink or brush teeth for an hour before the experiment; however, a few participants violated these requirements, and their exclusion is detailed in the results section. No participants reported taking medicines known to affect cortisol levels. The distribution was right skewed and a log transformation was used for inferential statistics. However, for ease of interpretation, raw means are reported.

Self-reported stress. Participants' level of self-reported stress was measured with 5 of the same 16 items used in Experiment 1: content (reverse-scored),

afraid, anxious, panicky, and stressed. Participants were asked only once, at the end of the experiment about their psychological stress ($\alpha = 0.73$). This reduction, along with many other methodological concessions, was made to save time so that we could keep the experiment under 2 hours.

Tasks and breaks. Participants completed three tasks which escalated in difficulty and creativity. The first task was structured to introduce them to the country and the plight of its people. Following the “data entry task,” participants completed the “creativity in entrepreneurship task” and finally the “business development project.” The experimental instructions for each emphasized the importance of the work. Instructions by the participants for each task are provided in the Online Supplemental Materials. The tasks were designed to be both realistic and work-like. Participants received two breaks during the 2-hour session. [One break presented artwork for participants to enjoy and the other presented music over headphones.](#) After each break, participants reported how relaxing and valuable their experience had been so far on a scale from 1 (*not at all*) to 7 (*extremely*).⁶ Details for all tasks and breaks can be found in the Online Supplemental Materials.

Results and discussion.

Does an economic mind-set cause psychological and physiological stress? Because we did not want participants to know the study was investigating stress, we only assessed self-reported stress after the tasks (as opposed to both before and after as was done in Experiment 1). A one-way ANOVA replicated the findings from Experiment 1: participants in an economic mind-set reported feeling more stress ($M = 2.33$; $SD = 0.84$) than those who were not in an economic mind-set ($M = 2.04$; $SD = 0.58$); $F_{(1, 102)} = 4.17$, $p < .04$. We used the typical ANCOVA (analysis of covariance) approach to examine the effect of the experimental manipulation “time is money” on cortisol at time 2 (controlling for time 1; inferential statistics conducted on log-transformed values but

raw data are presented as means in the following paragraphs). The data showed that those in an economic mind-set were 23.53 percent higher on salivary cortisol ($M_{\mu\text{g/dL}} = 0.21$; $SD = 0.13$) than those who were not in an economic mind-set ($M_{\mu\text{g/dL}} = 0.17$; $SD = 0.13$), $F_{(1, 85)} = 4.02$, $p < .044$. Following standard salivary cortisol exclusion procedures (Schultheiss & Stanton, 2009), this analysis excluded four extreme outliers (>3 SDs from the mean), four individuals who reported strenuous exercise within an hour before testing (e.g., running; kickboxing), and 10 individuals who violated sampling procedures such as eating or brushing teeth within an hour of the session. Adding additional controls to the model such as time of day (sessions were run at different times of the day and cortisol has a diurnal curve from morning until evening), gender, caffeine consumption, and number of hours slept (all known to affect cortisol results) did not materially change results ($p < .043$).

Did those in an economic mind-set report less of a pleasant experience? Consistent with past research (DeVoe & House, 2012), after the first break, when asked to reflect on the past 10 minutes which included some work time and some break time, those in an economic mind-set reported experiencing less of a pleasant experience (i.e., relaxation/value) from the work they were doing and the break they were having ($M = 3.73$; $SD = 1.40$) than those who were not in an economic mind-set ($M = 4.14$; $SD = 1.54$); $F_{(1, 100)} = 4.02$, $p < .05$. However, no similar effects were observed after the second break (all $ps > .05$).

Additional findings: attitudes toward money and time. Participants were also asked six questions about the time pressure they generally feel and about their attitudes toward money on a scale from 1 (*not at all*) to 7 (*extremely*). Three of the six questions revealed significant differences between those in an economic mind-set and those not in an economic mind-set. Specifically, those in an economic mind-set reported feeling that “when making important decisions (e.g., job choices), I primarily consider monetary criteria.” Those in an economic mind-set reported a mean of 4.86 ($SD = 1.37$) whereas those not in an economic mind-set reported less of an emphasis on money ($M = 4.35$; $SD = 1.46$); $F_{(1, 102)} = 3.35$, $p < .07$. Those in an economic mind-set also reported being significantly “more rushed or pressed for time” ($M = 3.90$; $SD = 0.76$) than those not in the economic mind-set ($M = 3.52$; $SD = 0.72$); $F_{(1, 102)} = 6.88$, $p < .01$. And finally, those in an economic mind-set reported “generally getting anxious about wasting time” more ($M = 3.78$; $SD = 0.84$) than those who were not in an economic mind-set ($M = 3.39$; $SD = 0.99$); $F_{(1, 102)} = 4.63$, $p < .03$. Thus, inducing people to think of their time as money created more

Author’s voice:

Was there anything that surprised you about the findings? If so, what?



⁶ *Additional Measures not Analyzed in Experiment 2.* At the very end of the experiment, we also gathered answers to a number of demographic items, including socioeconomic status (multiple items), political affiliation, grade, major, employment status, and retrospective evaluations of their experience. None of these data were analyzed.

feelings of time pressure (DeVoe & Pfeffer, 2011), more emphasis on economic criteria for choices, and more concern with not wasting time.

The three questions where there were no differences between participants in an economic mind-set and the control condition were (1) it is essential that my everyday choices reflect monetary considerations, (2) when making everyday decisions, my first priority is to consider what will most enhance my monetary situation, and (3) how do you agree/disagree with the saying, “time is money”? The first two questions assess the importance of money. Reminding people of the monetary value of their time apparently does *not* affect the importance they place on money overall but rather the influence of the economic evaluation of time on decisions about how to spend their time. The null result for the statement, “time is money” was unexpected and warrants further investigation. It is possibly an anomaly as previous research (DeVoe & Pfeffer, 2007b; Soman, 2001) did find that people in an economic mind-set accounted for time and money more similarly.

Does the EET Affect Creativity? As one part of the experiment, participants engaged in an explicitly creative task—they were told to come up with as many good ideas as they could about what a young entrepreneur in Uganda could start up that investors might be willing to fund. We coded these unstructured responses for their creativity to see if an EET affected people’s task performance. Following Guilford’s (1967) Alternative Uses Task, we coded three dimensions of creativity: fluency (i.e., how any items were listed), originality (a subjective 7-point score from unoriginal to original), and flexibility (how many categories were spanned by the responses, e.g., agriculture, retail, construction, mining, etc.). To establish inter-rater reliability and help ensure coding accuracy, two coders blind to condition coded a random selection of 11 percent of the stimuli. Each dimension was coded separately and inter-rater reliability was achieved on all three dimensions ($\alpha = 0.89, 0.85, \text{ and } 0.73$ for fluency, originality, and categories, respectively). After reliability was achieved, one coder coded all of the stimuli to assess creativity.

There was no difference in any indicators of creativity across conditions. A MANOVA (multivariate analysis of variance) was used to investigate whether there was a main effect of condition across the three creativity measures on any one of them. Even though the three variables were on different scales, all met assumptions of MANOVA (e.g., normally distributed and on an interval scale). The MANOVA result showed no main effect of condition on creativity, Wilks’ $\lambda = 0.971, F_{(3, 99)} = 0.981, p > 0.40$. And there were no main effects individually on fluency, originality, or categories (all $ps > .23$). Detailed analyses

of these null results are presented in the Online Supplemental Materials.

Thus, we found that although a commodified view of time affected stress, it did not affect at least one important measure of task performance, people’s ability to come up with creative entrepreneurial ideas. We had no *a priori* reason to expect an effect on creativity. Everyone received the same pay, did the same task, and was primed to think the task was important. Compared with many experimental tasks, this one seemed to be reasonably intrinsically interesting. And on the one hand, stress is related to general arousal levels, and it is possible that heightened arousal or tension could increase a dimension of task performance such as creativity. On the other hand, stress also interferes with high-level cognitive functioning and imposes a cognitive burden, which, could have resulted in poorer performance on the creativity task.

Because stress or arousal has been shown to have a curvilinear relationship with task performance, we examined the possibility of nonlinearity in the effect of the EET on creativity. To test this, we examined three regression models predicting a composite creativity index (after z-scoring and averaging the three indices that were on different scales). The three regression models examined linear, quadratic, and cubic interactions with condition on the dependent measure of creativity. No effects were significant (all $ps > .44$). The same set of analyses was conducted using cortisol as the measure of stress and no effects were observed (all $ps > .42$).

Discussion. These data, from a naturalistic experiment that simulated people working in an organization on real tasks, provide evidence that an economic mind-set that makes salient the monetary value of a person’s time causes both work and break time to be perceived as less relaxing, increases the overall perception of stress, and increases the level of the stress hormone, cortisol, compared with people not experimentally induced to calculate the monetary value of their time. Cortisol levels were almost 25 percent higher for people in an EET mind-set. Having an experimentally induced, commodified view of time does not, however, apparently affect people’s work product, as we observed no effect on the creativity of the ideas they came up with.

GENERAL DISCUSSION

Beginning with Kaveny (2001) and continuing through Evans, Kunda, and Barley (2004), DeVoe and Pfeffer (2007a, 2007b), and Whillans and Dunn (2015), the writing on the EET has consistently made the same point: *how* people are paid at work—not just how much, which is obviously also consequential—but whether or not they are paid by the hour or account for their time on a time sheet, has

effects on how people think about time and make decisions about spending time, including how they spend their time off the job. The research discovery described in this article expands the importance of considering how people are paid by finding an effect not just on how people spend time or their environmental attitudes but on measures of psychological and physiological stress, which has important implications for people's health and well-being.

Of course, the idea that organizational environments are consequential in many ways for the people who work in them and that aspects of work environments can create stress are well-established findings (Colligan & Higgins, 2006). What is new, and potentially very important from an organizational and public policy perspective, is the finding that payment systems and practices, and particularly the extent to which pay and measurement practices make the time–money connection salient, have effects on people's experienced levels of stress.

Hypothesized Mechanisms through Which Thinking of Time Like Money Might Increase Stress

The EET—thinking of time as money—is created in part, through hourly payment systems (DeVoe & Pfeffer, 2007b; Whillans & Dunn, 2015) and by having people keep track of their time on a time sheet (DeVoe & Pfeffer, 2010), billing time like lawyers and many consultants do, or budgeting limited time for each patient or client to see as many as possible within a specific time frame. These practices reinforce the conception of time as a valuable resource to be managed and allocated carefully and make focal the conception of time as synonymous with money. Moreover, when people are asked to calculate the economic value of their time (DeVoe & Pfeffer, 2007b; Whillans & Dunn, 2015)—how much they are implicitly earning per hour—that “calculate hourly pay” intervention in experiments changes their decisions about how to spend their time (DeVoe & Pfeffer, 2007a, 2007b) and their environmental attitudes (Whillans & Dunn, 2015).

There are several possible stress-inducing consequences arising from a commodified view of time. First, it is possible that thinking of time as money increases people's impatience, which is a source and cause of stress (Compas, 1987). For instance, DeVoe and House (2012) reported data demonstrating a connection between the EET and impatience. Psychological impatience was significantly higher when the EET was salient and this impatience caused less enjoyment of otherwise pleasurable activities such as listening to music or leisurely surfing the internet. DeVoe and House (2012: 467) argued that making the economic value of time salient engendered impatience because

people were more likely to see themselves as wasting time when not doing a prescribed task and that thinking of time as similar to money “interfere[d] with other, less quantifiable benefits of time's expenditure, specifically hedonic pleasure.” Some of our empirical results are consistent with the idea that making the time–money connection increases experienced time pressure, which would be stressful.

Second, a commodified view of time can create the perception that time is a scarce and valuable resource that needs to be managed and used carefully—thereby creating more stress caused by the psychological pressure to “spend time wisely” because it is a scarce resource not to be wasted. Evans et al.'s (2004) study of technical contractors, all of whom were paid by the hour, provided ample ethnographic evidence of this phenomenon, with the contractors often thinking about the money they were losing and if they should be taking time off even when they were engaged in leisure activities. Both impatience and self-reported decision-making pressure have empirical links to stress and health problems associated with stress (Booth-Kewley & Friedman, 1987; Ohman, Nordby, & Svebak, 1989).

Third, activating an economic mind-set may cause people to spend more time simply thinking of time as money, thereby distracting their attention from other things they are doing and increasing cognitive load. This increased cognitive burden and distraction could adversely affect task performance, which in turn would induce stress from not being as effective on the task at hand. And the increased cognitive burden from more often thinking about time as money could be experienced as stressful in and of itself. This possible explanation is, however, somewhat inconsistent with the findings from Experiment 2 showing that creativity did not differ across condition. However, there may be other manifestations of increased cognitive load or burden.

Fourth, Kaveny (2001) argued that a commodified conception of time caused lawyers who billed their time to not enjoy their work as much. She noted that a commodified view of time caused lawyers to become alienated from the events in their lives (such as coaching their children's sports) because they were chronically thinking about the opportunity costs of their non-work activities such as taking time off and spending time with friends and family. Moreover, constantly thinking of work primarily in terms of its monetary aspects separated people from the non-economic meaning of that work; that is, the intrinsic interest in and sense of accomplishment from doing something for itself. Consequently, work might become more stressful because its meaning and purpose would be lost in its close association with an external reinforcer—money.

These hypothesized mechanisms and possibly others suggest that a commodified view of time could increase workplace stress. In the research reported here, it is important to note that the experiments were designed to hold constant numerous other factors that might affect experienced stress and that could vary with hourly payment. For instance, much hourly paid work is today under the control of scheduling algorithms so that people paid by the hour have difficulty predicting how many hours they will work—and thus how much money they will earn—week to week. This economic insecurity would be stressful, but is obviously not relevant to our experimental study. We held constant things such as the specific tasks people did, the amount of money they received for participating in the study, and the amount of time they spent on various activities during the study. Everyone did precisely the same thing, for the same amount of time, and earned the identical amount of money. Moreover, the recruitment of study participants ensured that they knew precisely what they would be paid and how long the study would take when they signed up. The *only* thing that varied was whether participants had the economic value of their time made salient. In addition, participants were randomly assigned to experimental condition so that it was reasonably assured that people were roughly equivalent across conditions in terms of their attitudes about money and its importance as well as other individual differences.

In these first tests of the argument that the EET causes stress, the possible mediating and moderating processes were not measured (e.g., self-reported impatience, cognitive load, people's identification with the task and their intrinsic motivation, and their level of distraction). Our objective was to empirically test for the existence of a connection between making the economic value of time salient and increases in stress as assessed by both psychological and physiological outcomes. However, future research should both replicate these results and investigate the psychological mechanisms such as those we have outlined that may produce these outcomes.

Theoretical Implications and Future Research

Beyond understanding the mechanisms that link the commodification of time to stress at work, another theoretical implication concerns how to study time and its role in organizational life. Time has long been recognized in management literature as an important, but neglected, concept (Bluedorn & Denhardt, 1988; Butler, 1995). In a variety of research literatures ranging from philosophy to anthropology to social psychology to the geography of variations in life spans (the so-called blue zones),

there are suggestions that people's orientations to time could be psychologically and physiologically consequential. Buettner (2012), in his study of the Greek island of Ikaria where people live a very long time, quoted one of the island's physicians as noting that on that island, no one wears a watch and none of the clocks work correctly—that people simply do not care about the clock. Lakoff and Johnson (1999: 164) argued that “our culture happens to have a great many institutions that reify the Time Is a Resource and Time Is Money metaphors,” but “not every culture has such institutions” and therefore not all cultures think of time as money. Behavioral decision theory takes as one important object of study people's implicit discount rate (i.e., their willingness to trade off rewards today for even greater rewards in the future; Hardisty, Thompson, Krantz, & Weber, 2013), and future orientation has been studied in social psychology (Mischel, Ebbesen, & Raskoff Zeiss, 1972; Mischel, Shoda, & Rodriguez, 1989).

To empirically explore this important topic—how people think about time and the related consequences of their mind-sets about time—researchers first need to decide which aspects of people's thinking about and orientation toward time are most theoretically important, and how, and which consequences or outcomes might be of most interest. This article provides one, but only one, possible approach to this question. Given the growing research literature on the effects of thinking of time in terms of money (Pfeffer & DeVoe, 2012) and the empirical relation between the EET and experienced impatience (DeVoe & House, 2012), arguably a form of stress, and given the literature on the “billable hour” and its effects on stress and unhappiness (Kaveny, 2001), the EET seems like one reasonable theoretical entry point for exploring theoretical ideas about time in organizations.

There are obviously other dimensions of time that may also be stress inducing and that warrant further exploration. As suggested by Buettner's (2012) research on longevity, even having clocks and a concomitant emphasis on scheduling and punctuality may be stressful. It is also possible that worrying about the future or replaying past events could increase stress over the mantra to live in the present (Dass, 1978).

And there are other important consequences of orientation toward time besides stress. It is possible that people with a resource-like view of time and a time-money orientation make better, more rational, and careful decisions about time use that help make them more successful. All of these additional dimensions of both conceptualizations of time and their many consequences should be explored in subsequent research.

Another important avenue for further theoretical and empirical development is a better understanding

of how a commodified view of time affects people's psychological relationship with their work and other aspects of their lives. For instance, if people who think of time as money feel pressure to spend time wisely, not only are they less likely to volunteer and more likely to trade time for money, but they also may be less likely to approach social relationships in an expressive rather than instrumental way. In other words, people with a commodified view of time may be less likely to want to spend time with friends who cannot be economically or otherwise instrumentally useful to them. And, by extension, when people are socializing, to the extent they think of their time as money, they may experience more impatience and experience more stress. Moreover, impatience and the pressure to use time wisely might be two psychological processes affecting how the time–money connection impacts people's relationship to their work. So, people with a commodified view of time might be more chronically impatient and this impatience and the need to always calculate how to best spend time could cause them to be less identified with and satisfied with their work, other things being equal.

To the extent that an EET causes stress and this result is replicated and extended, it then becomes important to understand how a commodified view of time might be reduced in situations in which the hourly value of people's time is chronically salient. This task would require understanding how people get out of thinking about time—something they regularly do at play—and how to induce this temporally disconnected psychological state.

Limitations

The limitations of the present research include a smaller sample size in Experiment 1, p values hovering around 0.05 for almost all effects in both experiments, and the possibility that results would not generalize to real working environments. To address the first limitation, the effect on self-reported stress in the small sample was replicated in a larger sample in Experiment 2. However, both effects were small and p values were close to 0.05 in both cases. Relatedly, all p values hovered around 0.05 which may mean these effects are fragile, or worse, that they are not real. However, an entire distribution of p values testing the effects of an economic mind-set on stress would need to exist before we can conclude that the effects reported here were found because of Type 1 error. Because the observed effects are consistent with a number of previous studies and theorizing across disciplines, we believe these results offer preliminary insight into a phenomenon that holds promise but the data should be interpreted as initial and this topic requires more attention.

The results may not generalize to real working environments because both experiments were laboratory studies. However, Experiment 2 was advertised as a job and treated as such experimentally. And a counterargument to the generalizability concern is that it is possibly more difficult to find effects of the commodification of time in the laboratory when paychecks are not real, monetary amounts are small, the duration of the experiment is necessarily much shorter and less extensive than people's real work situations, and subject pool participants do not really care that much about what they are doing. In the real world, stakes are high, money is real, and time is scarce. As Belogolovsky and Bamberger (2014: 1728–1729) noted, “the existing literature on the generalizability of laboratory-based organizational research . . . suggest that . . . results and effect sizes would be more robust in the field.” Moreover, they summarized research showing that “the correlation between effect sizes obtained in laboratory and field settings generally exceed 0.70, indicating similarity between results obtained from field and laboratory studies.”

Two other possibilities limit the generalizability of these findings beyond the experimental context. The first is that, over time, people may psychologically adjust to thinking of their time as money so, whatever the initial effect on stress, that effect would diminish as people acclimate to a commodified view of time. Although this is quite possible, we should note that in studies that accessed representative samples of working adults, there were observed effects of an EET on volunteering (DeVoe & Pfeffer, 2007a) and people's willingness to trade time for money (DeVoe & Pfeffer, 2007b). Nonetheless, the time dependency of the commodification of time should be explored. In this regard, it is important to note that whereas virtually all surveys ask people about their income, very, very few ask people whether their pay is based on time (hourly pay) or some other factor, and even fewer data collection efforts assess whether or not people keep track of their time—bill their time—on time sheets. It would take the addition of only one or two questions to already-administered surveys to vastly expand the amount of survey-based data potentially available to explore the effects of an EET.

Second, it is possible that people who already think of their time as money self-select into jobs or organizations that pay by time. Of course, in an experimental context, self-selection cannot offer an alternative explanation of the results as people are randomly assigned to condition. But in the world, the possibility of self-selection offers a mechanism that would possibly delimit the generalizability of our findings. People who self-select into roles that commodify time might be less stressed because they

have chosen those roles and environments, although it is important to note that people are also not always perfectly able to foresee the psychological consequences of their choices.

Managerial and Policy Implications

The contemporary world often encourages people to calculate the economic value of time. For example, many pay systems print out an individual's hourly rate of pay, even for salaried employees not paid by the hour. The software imputes an hourly pay rate by taking the individual's annual salary and dividing by 2,080 hours (40 hours per week multiplied by 52 weeks in a year). And an online tool from ClearerThinking.org encourages users to calculate the economic value of their time as a way of promoting and helping users achieve more "economically rational" decisions about time use (Shellenbarger, 2015). Popular books offer advice about how to manage time so that individuals can get more done and make more money—ironically, suggesting that if we do so, we will have more time for leisure. Unfortunately, however, research suggests that once people are in an economic mind-set, the value of such leisure time—and the enjoyment experienced—drops significantly.

As Davis (2016) has noted, an evolution in work has occurred—first, from (long-term) careers to now, more transitory, short-term jobs because there is less long-term employment (Cappelli, 1999). More recently, Davis argued that there has been a further evolution in work, from jobs to tasks—the so-called "gig" economy in which people do not work for one employer but instead take on tasks or assignments for many employers and, correspondingly, companies have fewer employees but more people with whom they contract to do specific, demarcated, tasks such as specific pieces of programming work or transportation of packages or delivery of groceries. The implication is that ever more people are going to be in situations in which the economic value of their time is going to be more salient. To the extent that a commodified view of time leads to more stress and less enjoyment of and identification with work, this shifting job landscape may help explain the relatively low levels of employee engagement so often observed and foretells possibly even less engagement in the future. Moreover, the stress-inducing aspects of these new work arrangements may have implications for overall population health.

To this point, decisions about the organization and payment for work have mostly considered economic cost and efficiency on the one hand and the possibility that some forms of payment may undermine intrinsic motivation on the other. To the extent that the findings presented here get replicated and extended, decisions about work organization and payment could and

should usefully incorporate the stress and, by extension, health consequences of different work and payment regimes as well.

CONCLUSION

Based on the empirical work reported here and the existing research literature, it seems clear that the EET seems to be *one* important dimension of how people think about time. Moreover, an EET—thinking of time as similar to money (Soman, 2001)—is something affected by organizational arrangements such as how people are paid and how and if they bill their time on time sheets. More people are paid by the hour now than in the past, and in fact, the proportion of people paid by salary is less than what would be expected (Hamermesh, 2002). Hourly pay and the EET is ever more important in the so-called "gig" economy of micro-transactions. For instance, a company called Spare5 turns idle time, such as waiting in line, into cash, albeit a very low hourly rate of pay. So as a reporter wrote, "Last week, I had a few minutes to kill so... I made a little cash. I installed an app called Spare5 on my iPhone and moments later, was using it to describe women's shoes" for an Internet retailer. Internet companies want people to monetize their downtime, to see even spare moments as resources that can be turned into money (Wingfield, 2014).

The possibility that an EET increases stress, which is precisely what we found in the two experiments reported here, is materially significant given the changing nature of work and the increasing focus on spending time productively—as defined by an economic conception of productivity. Research in the organization sciences *could* and possibly *should* focus on how our views of time affect stress and, even more importantly, how such stress might be mitigated even in the presence of cues that make the time–money connection salient. Both the changing nature of employment and the physical and economic tolls that stress exacts make such a research agenda ever more important.

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Author's voice:
What was it like to work with
the other authors?



ONLINE SUPPLEMENTAL MATERIALS

Detailed Description of Salivary Cortisol Measurement

Before providing saliva samples, participants did not eat, drink, or brush their teeth for at least two hours. Participants were tested in the afternoon (12:00–4:00 p.m.) to control for diurnal rhythms in hormones (Kudielka, et al., 2004). Each participant swallowed until his/her mouth was dry then passively drooled approximately 1.5 mL of saliva through a sterile straw into a sterile polypropylene microtubule. Saliva samples were immediately frozen (average temperature = -21.63) to avoid hormone degradation and to precipitate mucins. Two weeks after the end of the study, the frozen samples were packed in dry ice and shipped for analysis to Salimetrics in Santa Barbara, CA. At Salimetrics, the samples were assayed for salivary cortisol (12 percent of the sample was assayed in duplicate) using a highly sensitive enzyme immunoassay.

As is typical, there were outliers on the measures of cortisol. For Cortisol at baseline, six outliers with scores greater than 3 SDs above the mean were removed for the cortisol analyses. The mean (excluding outliers) was 0.25 SD = 0.14 and the cortisol scores for the outliers were 0.76, 1.32, 2.04, 2.05, 3.11, and 4.89. In addition, cortisol data for an additional four participants were excluded from this analysis because they indicated running, hiking, or kickboxing that morning with a score of 4 or 5 on a scale from 1 (*not strenuous*) to 5 (*extremely strenuous*).

Detailed Instructions for Tasks during Experiment 2

Data entry task instructions. “The first project you will work on is a data entry project. There are

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instructions in an envelope called DATA ENTRY PROJECT. We will be asking you some questions about your experiences along the way and remember, these projects are for real—the ideas you come up with could be used by you or others to make life in Uganda better for millions of young adults who are exactly like you. You will not have much time to do this but the goal is to produce an excel file with really good information that you will need to do the next task which is to develop business ideas by matching exploiting market opportunities (in other words, you need to figure out what the needs of the people are and match that to goods, services or labor). You will have about 20 minutes to complete this project. Go ahead and look in the envelope and get started.” This task was 20 minutes long and a 5-minute warning was offered.

Creativity in entrepreneurship instructions.

“Follow all the instructions in the envelope. We will come around to see if you have any questions or need anything. Be sure to save your excel file to the desktop. The goal of this project is to use all the data you entered from the last project and your newfound expertise about Uganda to generate a list of possible business ventures. You can be as open and creative or as serious and systematic as you wish. The goal here is to generate really good ideas and lots of them—things that a young entrepreneur in Uganda could start up and something that

investors there (or here) would take interest in. You do not need to select the best idea now nor do you need to plan anything—this is just a brainstorm. Use a different tab on your excel file to list ideas and make notes as you have these ideas. You will have about 15 minutes for this task. You can refer back to any of your materials and if you want to search the web for something you may also do that. But the goal is to come up with many ideas so do not get sidetracked and we will walk around to be sure you are on track and to see if you have any questions. These ideas can be yours or you can donate them to the lab so feel free to be as creative as you like.”

Business development project instructions.

“Please open up that envelope and follow instructions. You will have about 20 minutes to choose the best idea you have and you will follow the instructions to develop a business plan. This business plan can be yours or you can donate it to the lab so feel free to be as creative as you like.”

Results from Analyses of the Effects of Economic Evaluation on Creativity

All binary variables set to be 0, 1; EET = 0; male = 0.

All variables were centered before analyses; composite averages made on standardized variables.

Main Effect of EET Condition (vs. Control) on Creativity Outcomes

Predictor	Outcome	Unst. Beta	SE	<i>t</i>	<i>p</i>
EET vs. control	Originality score	-0.36	0.31	-1.19	0.237
EET vs. control	Number of items listed (i.e., "fluency")	-0.37	0.45	-0.81	0.42
EET vs. control	Number of categories represented	0.008	0.29	0.028	0.978
EET vs. control	Composite pair: originality + number	-0.20	0.15	-1.35	0.18
EET vs. control	Composite pair: originality + categories	-0.12	0.15	-0.79	0.43 ^a
EET vs. control	Composite pair: number + categories	-0.08	0.19	-4.18	0.68
EET vs. control	Composite creativity (all 3)	-0.13	0.15	-0.89	0.37

^a Controlling for gender and the gender \times condition interaction makes this effect marginally significant at $p < .09$ such that those in the EET condition were more creative.

Interaction of Gender and EET Condition (vs. Control) on Primary Composite Creativity Outcome

Predictor	Outcome	Unst. Beta	SE	<i>t</i>	<i>p</i>
EET vs. control \times gender	Originality score	0.39	0.44	0.90	0.79
EET vs. control \times gender	Number of items listed (i.e., "fluency")	0.36	0.43	0.83	0.41
EET vs. control \times gender	Number of categories represented	0.49	0.43	1.15	0.25
EET vs. control \times gender	Composite pair: originality + number	0.41	0.32	1.30	0.20
EET vs. control \times gender	Composite pair: originality + categories	0.37	0.32	1.67	0.25
EET vs. control \times gender	Composite pair: number + categories	0.44	0.32	0.14	0.89
EET vs. control \times gender	Composite creativity (all 3)	0.42	0.40	1.05	0.295

Interaction of Self-Reported Stress and EET Condition (vs. Control) on Primary Composite Creativity Outcome—Linear, Quadratic, and Cubic Effects

Predictor	Outcome	Unst. Beta	SE	<i>t</i>	<i>p</i>
EET vs. control \times self-reported stress (linear effect)	Composite creativity (all 3)	-0.13	0.16	-0.78	0.43
EET vs. control \times self-reported stress (quadratic effect)	Composite creativity (all 3)	0.06	0.11	0.51	0.61
EET vs. control \times self-reported stress (cubic effect)	Composite creativity (all 3)	0.05	0.13	0.37	0.71

Interaction of Cortisol Reactivity (Time 2 – Time 1) and EET Condition (vs. Control) on Primary Composite Creativity Outcome—Linear, Quadratic, and Cubic Effects

Predictor	Outcome	Unst. Beta	SE	<i>t</i>	<i>p</i>
EET vs. control \times self-reported stress (linear effect)	Composite creativity (all 3)	-0.02	0.17	-0.14	0.89
EET vs. control \times self-reported stress (quadratic effect)	Composite creativity (all 3)	-0.06	0.08	-0.73	0.47
EET vs. control \times self-reported stress (cubic effect)	Composite creativity (all 3)	-0.01	0.07	-0.11	0.92