Research Report

Checking email less frequently reduces stress

Kostadin Kushlev *, Elizabeth W. Dunn

University of British Columbia, Vancouver, Canada

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ABSTRACT

Using email is one of the most common online activities in the world today. Yet, very little experimental research has examined the effect of email on well-being. Utilizing a within-subjects design, we investigated how the frequency of checking email affects well-being over a period of two weeks. During one week, 124 adults were randomly assigned to limit checking their email to three times a day; during the other week, participants could check their email an unlimited number of times per day. We found that during the limited email use week, participants experienced significantly lower daily stress than during the unlimited email use week. Lower stress, in turn, predicted higher well-being on a diverse range of well-being outcomes. These findings highlight the benefits of checking email less frequently for reducing psychological stress.

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1. Introduction

Every day, 183 billion emails are sent and received worldwide (Radicati & Levenstein, 2013). Email is among the most widespread online activities—in a 2011 survey, 92% of US adults reported using email to communicate (Pew Research Center, 2011). In addition to this ubiquity of email, people's inboxes play a central role in their lives: More than one-third of US adults surveyed in 2014 said that email would be 'very hard' to give up—more than three times as many people who said the same about social media (Pew Research Center, 2014). And, according to one survey, about one-third of US workers report replying within 15 min of receiving a work email, and three-fourths reply within an hour (Kelleher, 2013). The popular press is rife with claims about the effects on well-being of this ubiquity of email in the life of today's information worker. Best sellers, such as the *Four Hour Work Week* (Ferriss, 2007), recommend a variety of approaches to reducing stress at work by, for example, checking email only twice a day. In stark contrast to this abundance of causal claims in the popular discourse, very little experimental research has explored how different approaches to dealing with email actually impact well-being. Accordingly, in the present research, we set out to conduct the first experimental field study to investigate whether the frequency with which people check email exerts a causal impact on their well-being.

Correlational research has provided preliminary evidence that dealing with email may be associated with negative outcomes for well-being (for a review, see Taylor, Fieldman, & Altman, 2008). This correlational research indicates that people who handle more email experience lower job satisfaction (Merten & Gloor, 2010) and perceive email as a greater source of stress (Jerejian, Reid, & Rees, 2013; Mano & Mesch, 2010). Similarly, people who spend more time on email report greater work overload (e.g., feeling emotionally drained, frustrated, and stressed from work; Barley, Meyerson, & Grodal, 2011). Of course, this correlational research does not enable inferences about the *causal* effect of email on well-being. A busier work schedule, for example, may result in both dealing with more email and perceiving one's job as a greater source of stress.

If email does have a causal effect on well-being, what specific aspects of dealing with a larger inbox influence well-being? One possibility is that simply thinking about the ballooning size of one's inbox directly causes more stress, thus compromising well-being. In contrast to this possibility, however, people who handle more emails at work perceive email as a way to improve work effectiveness (Mano & Mesch, 2010) and see themselves as more able to cope with stressors (Barley et al., 2011). Another popular idea is that email reduces well-being because it allows people to work longer hours, by, for example, answering emails from home (e.g., Renaud, Ramsay, & Hair, 2006). Contrary to this idea, the time spent working does not mediate the relationship between time spent on email and work overload (Barley et al., 2011). Thus, neither sheer email volume nor time spent on email seems to influence well-being directly. A third possibility is that the effect of dealing with email on well-being depends on the

* Corresponding author at: Department of Psychology, University of British Columbia, Vancouver, BC, Canada. Tel.: +1 778 866 2525.
   E-mail address: kostadinpk@psych.ubc.ca (K. Kushlev).

way people manage their large inboxes. Providing some initial support for this possibility, a training program in effective email management resulted in less self-reported workflow impairment due to email and reduced level of email strain (e.g., being annoyed by email; Soucek & Moser, 2010).

One critical aspect of managing email is how frequently people attend to their inbox (e.g., Dabbish & Kraut, 2006). Faced with the constant flow of new email messages, some people respond by frequently switching between other tasks and their email (Gonzáles & Mark, 2004; Jackson, Dawson, & Wilson, 2001, 2003; Whittaker, Bellotti, & Gwizdka, 2006; Whittaker & Sidner, 1997). Employees in one British company, for example, were interrupted by email on average every five minutes, and the typical worker responded within six seconds of receiving an email (Jackson et al., 2001, 2003). Even in the absence of such frequent external interruptions, email may provide a readily available source of distraction, which is important considering that self-interruptions account for 40% of all interruptions at work (Czerwinski, Horvitz, & Wilhite, 2004). In short, people often manage their email by attending to their inbox frequently, thus resulting in frequent interruptions and switching between tasks. In the present research, we set out to experimentally examine how the frequent interruptions and task switching due to email impact well-being.

2. Theory and relevance to basic research

A wealth of basic research and theory documents the toll of task switching on cognitive resources. Classical theorizing in cognitive psychology postulates that people have limited cognitive resources (Navon & Gopher, 1979; Pashler, 1998), and basic research has shown that when two tasks require the same cognitive resource (e.g., working memory), people cannot perform these tasks simultaneously and have to instead switch between tasks (Garavan, 1998; Liefooghe, Barrouillet, Vandierendonck, & Camos, 2008; Oberauer, 2003). According to the time-based resource sharing model of attention (Barrouillet, Bernardin, & Camos, 2004), the very act of switching between tasks requires deployment of attention, thus further taxing people's limited cognitive resources and resulting in greater cognitive load (Barrouillet et al., 2004; Liefooghe et al., 2008). To make matters worse, according to the load theory of attention (Lavie, 2010), higher cognitive load can further increase proneness to distraction (Lavie & De Fockert, 2005; Lavie, Hirst, De Fockert, & Viding, 2004), thus potentially resulting in even more multitasking.

Although relatively little research has directly examined how frequent task switching throughout the day impacts well-being, there are several reasons to believe that the cognitive tax associated with task switching may be detrimental to well-being. First, unsurprisingly, the greater cognitive load induced by frequent task switching has been postulated and shown to impair performance and speed of completing tasks that require cognitive effort (Bowman, Levine, Waite, & Gendron, 2010; Rubinstein, Meyer, & Evans, 2001). Thus, frequent multitasking may result in doing worse at work tasks, potentially increasing stress. In support of this prediction, when participants in a lab experiment were frequently interrupted by instant messages, they reported greater stress and frustration while working on another task (Mark, Gudith, & Klocke, 2008). In another study, after obtaining baseline measurements of task switching and physiological stress (as measured by heart rate variability) during three regular workdays, researchers asked a convenience sample of 13 workers to completely refrain from checking new email for five workdays (Mark, Voida, & Cordello, 2012). When they were cut off from new email, these workers both switched less between work tasks and experienced less stress as compared to baseline, suggesting a potential link between task switching and stress.

Second, both psychological theory and research suggest that cognitive resources are essential for emotion regulation (Holzel et al., 2011; Posner & Rothbart, 2007), and therefore, to the extent that switching between tasks taxes cognitive resources, frequent task switching may compromise emotional well-being. Indeed, experimental research has shown that increasing the frequency of interruptions during a cognitive task leads to less positive affect (Zijlstra, Roe, Leonora, & Krediet, 1999).

In short, basic theory and research suggest that frequent task switching can increase cognitive load and impair performance, with potential downstream consequences for well-being. In addition, recent research has shown that people tend to check their email frequently throughout the day (e.g., Jackson et al., 2001, 2003), thus effectively making email into a source of task switching. No experimental research, however, has ever directly explored whether the frequency with which people check their emails has an impact on well-being. Thus, building on psychological theory and basic research on task switching, we set out to conduct the first experimental field investigation directly examining how the frequency of checking email affects well-being.

3. Summary of the present research

Preliminary evidence has suggested a link between email and lower well-being, but most research has been correlational, preventing any causal conclusions. Furthermore, most researchers have used overall email volume to predict well-being, although evidence indicates that inbox size might matter less than the way people manage their large inboxes. A common approach to managing one's inbox is to check email frequently and respond to incoming messages quickly, which results in frequent task switching and task interruptions. Although some research suggests that interrupting and switching between tasks can be detrimental to well-being, no research has ever directly examined whether people experience improved well-being when they check email less frequently. In the present research, we set out to experimentally examine how the frequency of checking email affects subjective well-being.

4. Method

To examine whether checking email less frequently can improve well-being, we designed a two-week within-subjects study. Specifically, we randomly assigned participants to minimize the frequency of checking their email during one week and to maximize frequency during the other week. Based on previous research linking email to stress, we assessed weekly and daily stress, as well as stress during a particular important activity. Due to the dearth of research on how handling email can impact other components of well-being, we adopted an exploratory approach and assessed the effects of our manipulation on a wide range of established well-being outcomes. Specifically, given previous theorizing underscoring the importance of measuring theoretically distinct components of well-being (Biswas-Diener, Kashdan, & King, 2009; Kashdan, Biswas-Diener, & King, 2008; Ryan & Huta, 2009; Ryff, 1989), we included measures of both hedonic (e.g., affect) and eudaimonic well-being (e.g., meaning in life, environmental mastery). Finally, to capture other important aspects of optimal day-to-day functioning, we examined mindfulness, perceived sleep quality, and self-reported productivity.

4.1. Participants

A total of 142 adults agreed to participate in this two-week study. Eighteen participants dropped out of the study before

completing at least one questionnaire in each condition,[1] leaving a final sample of 124 participants (age: $M = 30$, $SD = 10$; sex: 67% female). Participants were predominantly Caucasian (55%) or Asian (28%). About two-thirds of the sample identified as either graduate or undergraduate students ($M_{age} = 27$ years). The remaining one-third of participants were community members who came from a range of occupations and industries including health care (e.g., doctor, pharmacist), academia (e.g., professor), finance (e.g., financial analyst), administration (e.g., secretary), and IT (e.g., software developer). Participants were recruited through posters in community centers, paid advertisements in local newspapers, listservs, and snowball sampling. We advertised the study as suitable for people who got a lot of email and sometimes felt overwhelmed by it. Participants only qualified for the study if they had some flexibility in how often they could check their email and were interested in experimenting with the way they managed their email. Participants received the chance to win $150 and the option to receive individualized feedback about their well-being during the study.

4.2. Design and manipulation

We used a counterbalanced within-subjects design. Participants were first invited to complete an initial survey, in which they completed basic demographic questions and reported how many times they checked their email on a typical workday. On the first Sunday after this initial survey, participants received a set of instructions on how to handle their email for the following work week. The next Sunday, participants received a different set of instructions for handling their email during the second week of the study. The order of instructions was counterbalanced, such that participants were randomly assigned to spend one week in our *unlimited email* condition and the other week in our *limited email* condition. Random assignment was performed using a random number generator.

In the *unlimited email* condition, we instructed participants to check their email as often as they could, and to keep their mailbox open throughout the day; additionally, participants were asked to switch on any email notification systems that they used. By contrast, in the *limited email* condition, we instructed participants to check their email 3 times per day, while keeping their mailbox closed during the rest of the day and switching off any new email alerts. Although we sought to maximize the between-condition difference in how often people checked email, we imposed a fairly moderate limit on email usage ($3\times$/day) with the goal of enabling a diverse sample of participants to comply with the instructions.

At 5 pm on each weekday during the two study weeks, we sent participants a link to complete a survey. Because we wanted to include busy professionals in our sample, we limited the time necessary to complete each daily survey to approximately 10 min. Thus, some measures evaluating day-to-day well-being were included only on certain days. Specifically, some scales were administered only on Monday, Wednesday, and Friday, whereas others were administered only on Tuesday and Thursday. In addition, for longer measures, we preselected items from existing scales in order to create shorter scales that could be administered more frequently throughout the study. All scales, including abbreviated scales, showed acceptable to good statistical reliability (see Table 1). All survey questions and the verbatim manipulation instructions are available online at osf.io/cx7z6.

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[1] Of the 18 people who dropped out before completing at least one survey per week, 7 did not complete any surveys during both weeks and the remaining 11 completed at least one survey during the first week, but none in the second week. For those 11, the dropout rate from each condition was virtually the same: 8% dropped out when checking email was minimized and when 8% when checking email was maximized.

The average number of surveys participants completed per week was 4.4/5, indicating a good overall completion rate. Importantly, there were no differences in completion rate between the *limited* ($M = 4.4$) and *unlimited* ($M = 4.4$) conditions. Because some participants did not complete surveys on some days, degrees of freedom vary somewhat between measures.

4.3. Measures

4.3.1. Manipulation checks

We measured the successfulness of the manipulation with self-report measures of the frequency with which people checked email on particular days of the week. Although more objective estimates of the frequency of checking email can be obtained using software that tracks actual behavior, we opted for self-report measures in order to be able to recruit participants from a wide range of different professions and companies. In addition, because each survey was completed at the end of the day, we expect people's self-reports to be fairly accurate representations of their actual behavior (c.f., Kahneman, Krueger, Schkade, Schwarz, & Stone, 2004). Accordingly, on Monday and Friday of each week, participants reported how often they had checked their email throughout the day on a scale from 0 to 30+; participants were encouraged to report their actual email use regardless of the experimental instructions. At the initial baseline survey before participants were assigned to condition, participants also reported the number of times they normally checked their email during a workday. In addition, on Mondays and Fridays of each week of the experiment, we also collected other descriptive information about email use, including the time spent using email and the number of emails received and answered.

4.3.2. Dependent measures
4.3.2.1. Day-level measures.
Each daily survey asked participants to report how distracted they felt by email and included a series of questions broadly assessing their subjective experience during that day. Specifically, to assess well-being, we measured stress, as well as hedonic and eudaimonic components of well-being, including daily affect (i.e., positive and negative affect), social connectedness, environmental mastery, nonhedonic well-being, and meaning in life. Additionally, we measured their overall state mindfulness, productivity, and sleep quality (see Table 1).

4.3.2.2. Activity-level measures.
On Wednesday of each week, participants were prompted to select one of the most important activities they did on this day. Our goal was to assess people's level of stress and basic need satisfaction (Ryan & Deci, 2000) during a particular activity. Specifically, we measured task tension, perceived competence, and interest/enjoyment (see Table 1).

4.3.2.3. Week-level measures.
Finally, we measured participants' overall evaluation of their well-being over each week of the study. Specifically, on Thursday of each week, participants completed measures of stress, environmental mastery, presence of meaning in life, and perceived productivity with regards to their experience "over the past week" (see Table 1).

5. Results

5.1. Manipulation checks

Confirming the success of our manipulation, people checked their email significantly fewer times per day in the *limited email* condition ($M = 4.70$, $SD = 4.10$) than in the *unlimited email* condition ($M = 12.54$, $SD = 8.02$; $t[115] = -10.23$, $p < .001$). Importantly,

Table 1
Measures and main effects.

Level	Variable	Source	Scale	Days measured	Selected items	Item selection rationale	α's	M (SD) limited email	M (SD) unlimited email	Cohen's d
Day	Email distraction	NA	0 – not at all; 6 – very much	Monday, Tuesday, Wednesday, Thursday, Friday	"Overall, how distracted were you by your emails today?"	We created a face-valid item	NA	1.83 (1.18)	2.18 (1.36)	−.51[**]
	Stress	Perceived Stress Scale (PSS, Cohen, Kamarck, & Mermelstein, 1983)	0 – never; 4 – very often	Monday, Tuesday, Wednesday, Thursday, Friday	"1. Today, how often have you felt that you were unable to control the important things in your life?"	We picked 5 items from this 10-item measure because they were adaptable to measure daily stress	.55–.85	1.46 (.55)	1.55 (.57)	−.37[*]
					"2. Today, how often have you felt nervous and 'stressed'?"					
					"3. Today, how often have you found that you could not cope with all the things that you had to do?"					
					"4. Today, how often have you felt that you were on top of things?" (R)					
					"5. Today, how often have you been angered because of things that were outside of your control?"					
	Positive and negative affect	PANAS (Watson, Clark, & Tellegen, 1988).	1 – very slightly or not at all; 5 – extremely	Tuesday, Thursday	All 20 items + an additional item ('happy') in the positive affect scale (see Aknin, Dunn, Whillans, Grant, & Norton, 2013)	NA	Positive .90–.91	2.87 (.65)	2.90 (.69)	−.10
							Negative .86–.89	1.73 (.61)	1.71 (.61)	.08
	Nonhedonic well-being	White and Dolan (2009)	0 – not at all; 6 – very much	Monday, Wednesday, Friday	All items	NA	.86–.93	3.76 (.93)	3.71 (1.01)	.15
	Environmental mastery	Environmental mastery—short scale (EM; Ryff & Keys, 1995)	1 – strongly disagree; 6 – strongly agree	Tuesday, Thursday	All items.	NA	.60–.78	4.06 (.80)	4.10 (.88)	−.08
	Social connectedness	Social connectedness scale (Lee, Draper, & Lee, 2001)	1 – strongly disagree; 6 – strongly agree	Monday, Tuesday, Wednesday, Thursday, Friday	"1. Today, I felt distant from people." (R)	We chose 2 items from this 20-item scale. Item 1 was chosen because it had the highest factor loading of all other items. Item 2 was chosen because it had strong face validity	.75–.85	4.10 (.87)	4.07 (.88)	.06
					"2. Today, I felt close to people."					
	Meaning in life	Kushlev, Dunn, and Ashton-James (2012)	0 – not at all; 6 – very much	Tuesday, Thursday	Single-item scale	NA	NA	3.47 (1.18)	3.40 (1.20)	.12
	State mindfulness	State mindfulness scale (Brown & Ryan, 2003)	1 – almost never; 6 – almost always	Monday, Tuesday, Wednesday, Thursday, Friday	All items		.85–.90	2.51 (.71)	2.64 (.83)	−.22
	Perceived productivity	NA	0 – not at all; 6 – very much	Monday, Tuesday, Wednesday, Thursday	"1. Overall today, did you feel you got done the things at work that were most important to you?"	We created Items 1 and 2 to as face-valid measures of people's sense of accomplishment from work. Item 3 was adapted from the basic need satisfaction at work scale	.85–.92	3.47 (1.06)	3.41 (1.14)	.12
					"2. Overall today, how satisfied were you with what you accomplished at work?"					
					"3. Overall today, to what extent did you feel a sense of accomplishment from working?"					
	Sleep quality	NA	0 – very bad; 6 – very good	Monday, Tuesday, Wednesday, Thursday,	"Overall, how would your rate the quality of your sleep last night?"	We created a face-valid measure of sleep	NA	3.71 (1.09)	3.79 (1.00)	−.19

Table 1 (continued)

Level	Variable	Source	Scale	Days measured	Selected items	Item selection rationale	α's	M (SD) limited email	M (SD) unlimited email	Cohen's d
				Friday						
Activity	Pressure/tension	Ryan, Mims, and Koestner (1983)	1 – not at all true; 7 – very true	Wednesday	All items	NA	.76–.86	3.50 (1.48)	3.81 (1.34)	−.45[†]
	Interest/enjoyment	Ryan (1982)	1 – not at all true; 7 – very true	Wednesday	All items	NA	.93–.94	3.52 (1.46)	3.80 (1.53)	−.39[†]
	Perceived competence	McAuley, Duncan, and Tammen (1987)	1 – not at all true; 7 – very true	Wednesday	All items	NA	.92–.94	4.64 (1.54)	4.44 (1.46)	.28
Week	Stress	PSS (Cohen et al., 1983)	0 – never; 4 – very often	Thursday	All items	NA	.82–.85	1.68 (.63)	1.67 (.67)	.04
	Environmental mastery	EM (Ryff & Keys, 1995)	1 – strongly disagree; 6 – strongly agree	Thursday	All items	NA	.73–.84	4.05 (1.06)	4.02 (.99)	.07
	Meaning in life	Meaning in life questionnaire—presence of meaning subscale (Steger, Frazier, Oishi, & Kaler, 2006)	1 – absolutely untrue; 7 – absolutely true	Thursday	All items	NA	.92	4.69 (1.48)	4.65 (1.35)	.09
	Perceived productivity	NA	0 – not at all; 6 – very much	Thursday	See daily measure	See daily measure	.88–.90	3.55 (1.09)	3.56 (1.19)	−.01

Notes. Alpha values are calculated separately for each day the corresponding questionnaire was administered; stress was measured only on Monday, Wednesday, and Friday for some participants.

[†] $p < .10$.

[*] $p < .05$.

[**] $p < .01$.

the average number of times people reported checking their email on a normal day at work was 15.48 at baseline (SD = 8.69)—similar to number of times reported in the *unlimited email* condition, but substantially higher than in the *limited email* condition. Thus, our experimental manipulation made people check their email less frequently than usual in the *limited email* condition, but produced trivial differences in people's behavior as compared to normal in the *unlimited email* condition. In short, our manipulation was successful in inducing differences in how people managed their email across conditions with the *limited email* instructions driving these differences in behavior. Intriguingly, there were no significant differences between conditions in how many emails people received (M_{limited} = 16.64 vs. $M_{\text{unlimited}}$ = 16.04, $t(114)$ = 1.31, p = .19) or responded to (M_{limited} = 5.30 vs. $M_{\text{unlimited}}$ = 5.95, $t(115)$ = −1.58, p = .12), suggesting that our manipulation primarily affected how often people checked email rather than the volume of email they managed.

5.2. Direct effects

Our goal was to explore whether manipulating how often people checked email would affect their subjective experience. First, we ran a series of ANOVAS comparing people's experiences in each of the two conditions as assessed by all activity, day, and week level measures. In order to minimize the effect of individual day variation, we calculated weekly composites for all constructs that were assessed on more than one day of each week. We found that participants felt less daily stress in the *limited* as compared to the *unlimited email* condition, $F(1, 121)$ = 4.18, p = .04, Cohen's d = .37 (for descriptive statistics on all measures, see Table 1; d-scores were calculated using the paired-samples F-test conversion tool of the ESCI software, as recommended by Cumming, 2012). Consistent with this difference in day-to-day stress, when engaged in a specific important activity, people felt less tense in the *limited* as compared to the *unlimited email* condition, $F(1, 96)$ = 3.84, p = .05, Cohen's d = .45. Interestingly, while limiting the frequency of checking email influenced people's daily stress and the tension they felt during a particular activity, the manipulation did not affect their memory of how stressful the week had been overall, $F(1, 91)$ = .04, p = .838, Cohen's d = .04. In addition to the main effects on stress, we also found that people felt less distracted by their email in the *limited* as compared to the *unlimited email* condition, $F(1, 123)$ = 8.04, p = .01, Cohen's d = .51. No other significant main effects emerged, although people reported marginally greater enjoyment during a particular important activity in the *unlimited* vs. *limited email* condition, $F(1, 96)$ = 3.71, p = .06, Cohen's d = .39.

To examine whether our manipulation produced different effects for students vs. community members, we ran a series of mixed ANOVAs with condition as a within-subjects factor and status (student vs. community member) as a between-subjects factor. We found that student status did not moderate the effect of condition on tension, $F(1, 94)$ = .65, p = .42, or daily stress, $F(1, 119)$ = 1.07, p = .30. Student status, however, moderated the effect of condition on distraction by email, $F(1, 121)$ = 5.27, p = .02, although the main effect of condition remained significant, $F(1, 121)$ = 4.29, p = .04. Post-hoc analyses indicated that while students were significantly less distracted by their email in the *limited email* condition than in the *unlimited email* condition (p = .001), community members were not (p = .89).

In short, stress was the only outcome variable that was consistently and directly influenced by our manipulation. Because stress can have a wide range of downstream consequences for well-being (Bolger, DeLongis, Kessler, & Schilling, 1989; Daniels & Guppy, 1994; DeLongis, Folkman, & Lazarus, 1988; Dua, 1994; Lazarus, 2006), reducing stress by checking email less often may have broader implications for well-being. Accordingly, we next examine
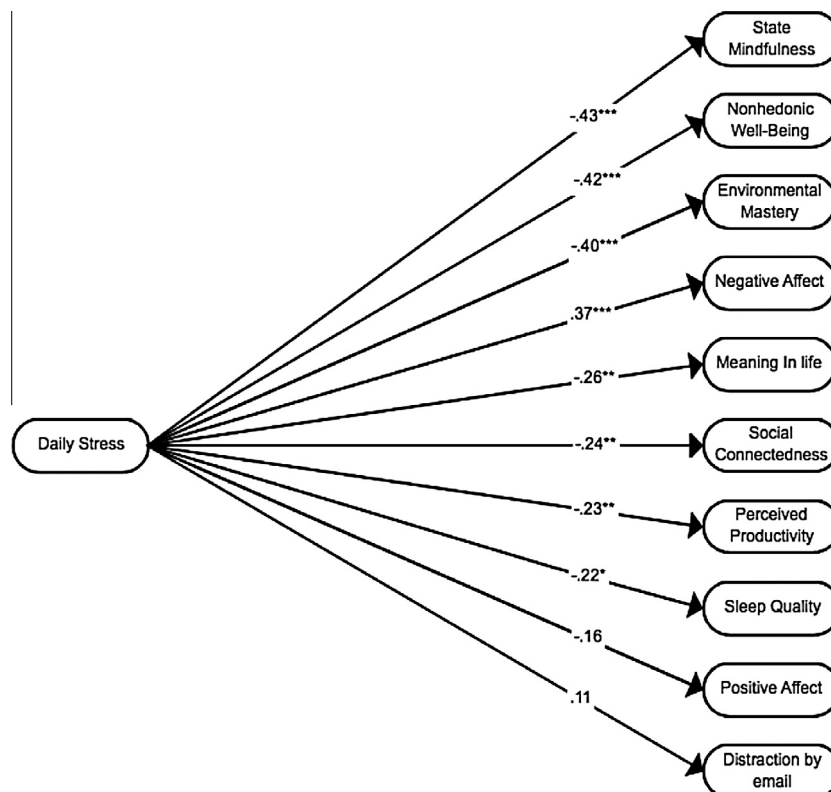
Fig. 1. Relationships between daily stress and daily well-being ordered by effect size (β). Effect sizes represent the effect of the difference in stress between the limited and unlimited email conditions on the difference in the outcomes measures between the two conditions (see Eq. (1) for details of analyses). $^*p$ < .05; $^{**}p$ < .01; $^{***}p$ < .001.

whether the differences in stress between conditions predicted other measures of well-being.

5.3. Indirect effects through stress

To examine the indirect effect of our manipulation on well-being through stress, we followed recommendations by Judd, Kenny, and McClelland (2001) for conducting mediation analyses with repeated measures. As show in Eq. (1) below, in each case, we predicted the difference scores in the outcome variables (Y) from sum and difference scores of stress (X). The difference scores were calculated by subtracting the *unlimited email* scores from their corresponding scores in the *limited email* week. The regression coefficient of the difference score of stress controlling for its sum score is the measure of indirect effect of condition on well-being through stress (Judd et al., 2001). If the difference score of stress significantly predicts the difference score of other well-being measures, this will provide initial evidence that by influencing stress, checking email less frequently may have broader implications for well-being.

$$Y_{\mathrm{diff}} = \beta_1 X_{\mathrm{sum}} + \beta_2 X_{\mathrm{diff}} + \varepsilon, \ \text{ where} \qquad (1)$$

(a) $Y_{\mathrm{diff}} = Y_{\mathrm{limited}} - Y_{\mathrm{unlimited}}$

(b) $X_{\mathrm{diff}} = X_{\mathrm{limited}} - X_{\mathrm{unlimited}}$

(c) $X_{\mathrm{sum}} = X_{\mathrm{limited}} + X_{\mathrm{unlimited}}$

Using Eq. (1), we found that lower daily stress in the *limited email* condition was associated with significantly better subjective experiences across almost all daily measures (see Fig. 1). That is, stress was associated with significantly higher negative affect ($\beta = .37$, $p < .001$) and marginally lower positive affect ($\beta = -.16$, $p = .10$). Stress was also negatively associated with state mindfulness ($\beta = -.43$, $p < .001$), nonhedonic well-being ($\beta = -.42$, $p < .001$), environmental mastery ($\beta = -.40$, $p < .001$), meaning in life ($\beta = -.26$, $p = .01$), social connectedness ($\beta = -.24$, $p = .01$), self-reported productivity ($\beta = -.23$, $p = .01$), and sleep quality ($\beta = -.22$, $p = .02$; see Fig. 1).

Finally, we examined whether daily stress predicted people's reports of their overall weekly well-being. Unsurprisingly, daily stress was predictive of weekly stress ($\beta = .50$, $p < .001$). Additionally, daily stress was related to weekly environmental mastery ($\beta = -.37$, $p < .001$). People who experienced more day-to-day stress also reported somewhat lower productivity ($\beta = -.19$, $p = .07$) and slightly less meaning in life ($\beta = -.12$, $p = .26$) during the week, although these effects did not reach statistical significance.

Taken together, this pattern of indirect effects points to the conclusion that checking email less frequently might have broader downstream consequences for well-being by reducing stress. Because indirect effect analyses are inherently correlational, however, the present research only provides direct causal evidence for the impact of our manipulation on stress.

6. Discussion

In the first experimental field study examining the effect of checking email less frequently, people experienced reduced stress when they were assigned to limit the number of times they checked their email. Specifically, limiting the number of times people checked their email per day lessened tension during a particular important activity and lowered overall day-to-day stress. In turn, lower daily stress was associated with higher well-being, as assessed by a range of outcomes including hedonic (e.g., affect) and eudaimonic outcomes (e.g., meaning in life, environmental mastery, social connectedness). Furthermore, lower stress was associated with other positive outcomes including higher mindfulness, self-perceived productivity, and sleep quality.

These findings provide causal evidence that checking email less frequently can directly decrease stress, with potential downstream benefits for well-being.

6.1. Implications and limitations

In line with recent recommendations to assess multiple specific components of well-being (Kashdan et al., 2008), we included a broad array of measures in our study. Given this exploratory approach, it is possible that the significant effects we observed on stress are simply an artifact of the large number of statistical tests we conducted. The present study, therefore, should be seen as laying the groundwork for future confirmatory research. That said, previous correlational research has also shown that the way people handle email is related to stress rather than other components of well-being (e.g., Jerejian et al., 2013; Mano & Mesch, 2010). The present findings dovetail with this existing work in suggesting that checking email less often primarily affects stress, rather than other components of well-being, such as people's sense of meaning in life. In short, our pattern of findings suggest that while checking email less frequently may help to alleviate stress, changing how frequently people check email is by no means a panacea for improving well-being.

Over time, however, it is conceivable that reduced levels of stress could eventually produce consequences for well-being more broadly. Indeed, a meta-analysis of forty-eight experimental studies ($n = 3736$) showed that stress reduction interventions have an impact on a range of outcomes including anxiety, symptoms of depression, and overall perceived quality of work life (van der Klink, Blonk, Schene, & van Dijk, 2001). Consistent with this research, we found that stress was associated with an overall poorer well-being in the course of our experiment. Thus, given that checking email less frequently can reduce stress in the course of a week, the benefits for other aspects of well-being might emerge over time.

The broader benefits of reducing the frequency of checking email on well-being might also be more likely to materialize if changes were made at the organizational level, rather than just the individual level. In our study, we manipulated participants' behavior, but had no control over the expectations of those around them. Indeed, recent research suggests that some people feel stressed by email in part because others expect them to reply quickly (e.g., Gillespie, Walsh, Winefields, Dua, & Stough, 2001). Organizations might be able to maximize workers' well-being by introducing interventions at a company-wide or team-wide level, thereby altering co-workers' expectations.

Another potential limitation of the present research is that we did not include a control condition in which participants completed our measures without being asked to alter their email usage patterns. At baseline, however, participants in our study reported checking email roughly the same number of times ($\sim$15) as people in the *unlimited email* condition ($\sim$13), but significantly more times than people in the *limited email* condition ($\sim$5). Thus, being instructed to check email as frequently as possible did not increase the number of times people checked email as compared to baseline, whereas being instructed to limit checking email reduced the number of times people checked email as compared to baseline. Our findings suggest, therefore, that checking email less frequently than normal reduces stress rather than that checking email more frequently than normal increases stress.

Of course, because our measures of frequency were based on self-reports, the particular values participants reported should be interpreted with caution. For the purposes of the present experimental research, however, we were not interested in estimating the exact number of times people checked their email, but rather in inducing an overall measurable difference in behavior across

the two experimental conditions. For this purpose, our measures indicate a clear reduction of the number of times people checked their email in the *limited email* condition as compared to baseline and the *unlimited email* condition.

More broadly, although the effects we observed did not depend on whether participants were students or community members, our reliance on a convenience sample raises important issues of generalizability. In particular, given that we intentionally recruited heavy email users who had some flexibility in the way they managed email, our intervention might be unlikely to reduce stress among individuals who receive little email or have no choice about how frequently they check email. In some professions, for example, workers rely on constant updates to successfully do their job (e.g., stock brokers), such that attempting to check email less often might be *more* stressful. Thus, future research with larger representative samples should explore when and for whom limiting email checking is beneficial vs. detrimental for well-being.

6.2. Coda

In conclusion, we employed careful experimental design to demonstrate that a simple change in how people approach email may reduce overall levels of stress on a typical day. Thus, by applying psychological theory and extending basic research on task switching, we provided evidence for the potential toll on well-being of frequent checking of email—one of the most common sources of task switching for the modern information worker.

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