# Focus Time: Effectiveness of Computer Assisted Protected Time for Wellbeing and Work Engagement of Information Workers

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Having little time for focused work is a major challenge of information work. While research has explored computing-assisted user-facing solutions for protecting time for focused work, there is limited empirical evidence about the long-term effectiveness of these features on wellbeing and work engagement. Towards this problem, we study the effects of automatically scheduling time for focused work on people's work calendars using the Focus Time feature on Outlook calendars. We conduct an experimental study over six weeks with 15 Treatment and 10 Control participants who responded to survey questions on wellbeing and work engagement throughout the study. We find that the Treatment participants showed significantly higher wellbeing, including increased excitement, relaxation, and satisfaction, and decreased anger, frustration, tiredness, and stress. We study the needs, benefits, and challenges of scheduling focus time, and discuss the importance of enabling mechanisms for focused work in organizations and design recommendations for tools supporting focused work.

Additional Key Words and Phrases: focus work, workplace, wellbeing, experimental study, time protection, information workers

## 1 INTRODUCTION

Managing time better at workplaces is one of the key interests of researchers and practitioners [37]. Workplaces have forever been evolving, and in recently, we have seen an increasing prevalence of remote and hybrid work as stimulated by the COVID-19 pandemic [33, 103]. While such work settings have enabled more flexibility and remote collaborations for information work [115], these have also added complexities in terms of the increased number of meetings, longer work hours, blurred work-life boundaries, more multi-tasking, and disrupted work-life balance [33, 58, 95]. These complexities have simultaneously added limits to an individual's ability and time to do self-focused work and affected their productivity and wellbeing [21, 105]. However, the importance of enabling individuals to do self-focused work cannot be overlooked by organizations. Past research in organizational behavior has shown that organizational performance depends on the right number of workers, proper identification of required skills in the workforce, and motivated workers with positive behavior geared towards improving the organization's performance [44]. In particular, the ability to concentrate, communicate and move quickly between individual and collaborative work has been found to significantly improve the work quality of individuals, which in turn improved the quality of organizational outcomes [85].

In the context of individual work, costs of task switching and disruptions due to notifications depletes productivity and negatively impacts wellbeing of individuals [7, 28, 47, 59, 65, 73]. Kushlev and Dunn found that limiting email checking

reduced stress, and Mark et al. noted that self-interruptions of emails lead to better productivity than notification-based interruptions. Other work found blocking notifications enhanced focused work and reduced multitasking and distractions [69, 74]. Research has also noted the importance of focused work in improving productivity and wellbeing [43, 69, 90]. Focused work is found to associate with cognitive absorption, which not only significantly impacts an individual's deep involvement, learning [1], and creativity [19], but also helps them be more relaxed and perceive greater control [62, 88].

To help individuals dedicate more time to focused work, HCI research has explored methods such as better notifications, time-protection tools, and other interventions [20, 38, 46, 48, 54, 57, 107]. However, there is a lack of evidence about the in-practice effectiveness and utility of these tools, i.e., how people actually use them in the wild and if these tools achieve the desired goals in the long-term. Towards this goal, this study examines the usage of a tool (Viva Focus Time) that programmatically schedules focus time on an information worker's work calendar and pauses notifications during these periods so that they can dedicate these times for focused work. We leverage validated metrics from organizational behavior research to measure the impact of automatic scheduling of focus time on the eudaimonic wellbeing in the workplace, or the wellbeing derived from realizing one's potential [16]. Our work asks the following research questions:

**RQ1: Immediate wellbeing and work engagement changes:** What are the expected and observed wellbeing changes of scheduling time for focused work in the short term (each week)?

**RQ2: Overall impact on wellbeing and work engagement:** Does scheduling focus time impact long-term workplace wellbeing and work engagement?

**RQ3: Use, benefits, and challenges of scheduling focus time:** How is the time set aside for focused work used in practice, and what are the perceived benefits and challenges of protecting time as such?

To answer these questions, we conducted a six-week long study with an experimental (Treatment) group who used the Focus Time feature for those six weeks to schedule a time to focus on their calendar on a daily basis to the extent possible. We collected their subjective feedback about their experience, and compared responses on validated wellbeing and work engagement measures before and after the study. We also compared the Treatment group with a Control group that did not use the Focus Time service but filled out the same questionnaires.

We find that, in comparison to the Control, the Treatment individuals showed an increase in their weekly feelings of bursting with energy and a decrease in weekly feelings of stress and difficulty in detaching from work. The Treatment individuals also showed improved wellbeing in several metrics, including affective attributes like anger, excitement, relaxation, frustration, satisfaction, and tiredness, and workplace engagement attributes such as eagerness to go to work, happiness during intense work, learning, and resilience. These observations point out improvements in the wellbeing of Treatment individuals following the use of Focus Time feature. We also examine what people did during the focus time periods and what are their needs, benefits, and challenges about using this feature. Our results suggest the importance for organizations to facilitate their employees to set aside time to focus on their calendars to improve the overall long-term wellbeing and productivity of the information workers. We discuss the implications of this research in designing tools to enable better use of focus time and how to overcome the current challenges with missing notifications and high-priority communications during focus time and emphasizing the transparency about using the Focus Time service on digital calendars.

## 2    RELATED WORK

### 2.1    The Role of Individual Work on Organizational Outcomes

An individual's wellbeing in the workplace translates to individual, collective, and organizational success [55]. However, the importance of nurturing individual experiences to influence desired organizational outcomes is often overlooked. Green studied how different individual, interpersonal, and organizational factors, including organizational policies, employee benefits, and performance appraisals associate with organizational outcomes [42]. Council elucidate how the five processes of coordination, problem-solving, the proper focus of attention, organizational evolution and motivation operating together in a congruent and reinforcing manner can impact how individual productivity contributes to organizational productivity.

In addition to productivity and efficiency-related outcomes, multiple facets of wellbeing have been shown to manifest in workplace settings. Workplace wellbeing involves the interaction between individual characteristics and organizational and environmental factors [8]. Research has emphasized the focus on workplace stress—stress that arises if the demands of an individual's roles and responsibilities exceed their capacity and capability to cope [24]. Workplace stress leads to not only impaired decision-making, productivity, and job satisfaction but also significant business costs—approximately USD 300 per year in the U.S. [9]. De Neve et al. proposed the importance of considering subjective wellbeing in the workplace as a coarse construct that leads to objective benefits across important life domains of 1) health and longevity, 2) income, productivity, and organizational benefits, and 3) individual and social behaviors [36].

Given the above considerations, employers have critical incentives to support their employees' needs and wellbeing. This work bears implications for multiple stakeholders for not only showcasing the importance but also in informing approaches and enabling mechanisms to support wellbeing in the workplace.

### 2.2    Supporting Workplace Wellbeing and Engagement for Individuals

Organizational science research has studied approaches to improve workplace wellbeing and engagement for individuals [8, 17]. HCI and UbiComp research has subsequently explored approaches to proactively support workplace wellbeing through sensing and computing-assisted technologies [11, 46, 57, 77]. The ubiquity and widespread use of smartphones and wearables have enabled the collection of longitudinal and dense human behavioral cues at scale [109, 110]. Prior research has used multimodal sensing through smartphone, wearable, bluetooth, and wireless sensors to try to infer job performance [82], mood and cognition [10, 11, 70, 97], social interactions [15, 76], organizational personas [29], organizational fit [32]. Mark et al. examined how email interactions relate with workplace stress and productivity [73]. Another work [71] leveraged digital activities of information workers to understand work patterns and attentional states [71]. Further, with the widespread use of online and social media technologies, prior research has argued that such data can serve as longitudinal, historical, and verbal passive sensors [91]. Different forms of digital data, including online social interactions, have enabled examining work engagement [84, 100], mood and affect [35, 101], organizational relationships [18, 40, 83], role constructs [93], organizational culture [34, 113], and job satisfaction [61, 94].

Recently, Howe et al. explored using just-in-time interventions for reducing stress of information workers. Overall, as the workplace has transitioned and evolved in recent years, also stimulated by the pandemic, with the increasing prevalence of remote and hybrid work, computing technologies are getting more and more embedded in the workplace [12, 33, 89, 114]. The fourth wave of industrial revolution [98] sees the work and workplace to change tremendously, and new technologies are fusing the physical, digital, and biological worlds [63].

Building on the above body of work, this paper helps provide empirical insights into the efficacy of a computer-assisted time-management tool toward wellbeing and work engagement of information workers.

### 2.3 Computer Assisted Time Management at Work

Time management for different activities is a form of planned behavior [64], and helps individuals be in control of their time and reach expected outcomes better. Time management is one of the key components of information work—information workers must constantly schedule and manage their time between meetings, work hours, and work-life balance [23]. Mark et al. noted how information work comprises of work fragmentation—short tasks and tasks switching rather than continuous activity [67]. Multi-tasking and disruptions because of notifications and interruptions can lower a worker's wellbeing, productivity, and work effectiveness [4, 21, 45, 68]. Mark et al. noted how multitasking activities can cause increased stress [75]. In addition, time for self-focused work gets deprioritized or is done only after work hours [80]. Traditionally, workers have used notebooks and to-do lists to manage time better to plan their day [39]. Similar approaches have transcended into using digital calendars and digital to-do and task management lists in more recent times [2, 79, 99]. These tools enable individuals to record personal and collaborative events, as well as to support reminders, meeting schedulers, and invitations.

One of the most common computer-assisted time management is through Pomodoro technique, which enables a worker to box a fixed time for mindful work followed by short breaks [22, 111]. This technique was also expanded as PomodoLock which blocked distractions in fixed boxes of time [52]. With the ubiquity of smartphone and mobile technologies, various approaches have been explored to help time-management, such as lockout mechanics [53] and vibrational feedback [86]. Recently, Tseng et al. built a conversational agent to help manage workers' distractions by negotiating boxes of time through blocking websites to help reduce workplace stress [107]. Other research have designed and explored conversational agents to minimize distractions and encourage focused work of information workers [43, 54]. Commercially, Viva Focus Time service provided on Microsoft Outlook calendars automatically schedules time blocks for focused work from available slots on an individual's outlook calendar [81]. This service essentially blocks notifications and distractions during these time windows and provides different suggestions and reminders that workers could adopt during their work day. Recently, Das Swain et al. examined the potential impact of Viva Focus Time on an information worker's schedule, to find that such a service can help information workers to rearrange their work schedules and and effective reduction in work activity [31].

Building on the above body of work, we conduct an experimental study where participants respond to weekly survey questions on wellbeing and work engagement, and we longitudinally observe the changes in the Treatment group against a Control group. In addition, we ask the participants about the needs, benefits, and challenges of using this service. This paper examines the in-practice utility and effectiveness of a computer-assisted time protection service (Viva Focus Time) towards the wellbeing and engagement of information workers. Our work also provides recommendations for organizational practices and designing tools that can help support self-focused work in the workplace.

## 3 STUDY AND DATA

### 3.1 Automated Service for Scheduling Focus Time in Work Calendar

We investigate the use and effectiveness of an automated service that schedules time on an information worker's work calendar. We work with Focus Time [81] service that comes integrated with Microsoft Outlook's enterprise solutions. When someone enables Focus Time, they can use it to regularly block time for self-considered top-priority work by

Table 1. Demographic distribution of the study participants.

| Question | Treatment | Control |
|---|---|---|
| Age | 20-30: 2, 30-40: 9, 40-50: 2, 50-60: 1, 60-70: 1 | 20-30: 3, 30-40: 1, 40-50: 5, 50-60: 1 |
| Gender | Man: 8, Woman: 7 | Man: 4, Woman: 5, Non-binary: 1 |
| Education Level | College graduate: 9, Post-graduate: 6 | Some college: 1, College graduate: 4, Post-graduate: 5 |
| Household Income | $50K-$75K: 1, $75K-$100K: 3, $100K-$125K: 3, $125K-$150K: 3, $150K+: 7 | $75K-$100K: 3, $100K-$125K: 2, $125K-$150K: 2, $150K: 3 |
| Industry | Financial: 3, Software: 3, Telecom.: 1, Automative: 2, Technology: 1, Sales: 1, Consulting: 1, Real Estate: 1, Service: 1, Healthcare: 1 | Financial: 3, Healthcare: 2, Technology: 2, Manufacturing: 2, Legal: 1 |

scheduling up to four hours every day to focus. During these Focus Time slots, they appear "busy" on their calendars, and the service can additionally silence notifications of chats and emails on their desktop / mobile work device. For the study, we asked individuals who had not used the service before to use it to schedule time to focus on their calendar and see if such a computing-assisted time protection feature would help their wellbeing and work engagement.



Fig. 1. Example figures to demonstrate configuring and using Focus Time feature on Outlook calendar.

## 3.2 Recruitment

Our study included two groups of participants — 1) Treatment participants, who would be asked to enable and use Focus Time feature on their work calendars, and 2) Control participants, who would not use Focus Time feature. Both groups responded to the same surveys with minor modifications— an entry survey, weekly check-in surveys, and an exit survey that includes questionnaires on wellbeing and work engagement.

We conducted our study with U.S.-based information workers through the Dscout platform. Dscout is a qualitative remote research platform [112], where individuals can sign-up as "scouts" to participate in various research studies (or "missions") posted by research and product teams. First, we included a screening survey to filter in eligible participants. The screening survey included questions related to participant demographics (age, gender, education, ethnicity, employment status, income) and employment attributes (employment status, industry, type of work, computer use, availability of Focus Time feature on workplace email and calendar, etc.). After the screening survey was up on the Dscout platform for over a week, we received 1,579 responses, among which—47 individuals satisfied some core requirements for our study—1)they responded "all or most of my day is spent on computer", 2) they had access to the Focus Time feature, 3) had never used it before, and 4) were willing to try it out for the study. From these 47 individuals,

Table 2. List of survey questions on worker wellbeing and productivity and their occurrence in the study.

| Keyword | Question | Response | When? |
|---|---|---|---|
| Angry | Over the last 30 days, how often have you felt **angry** at work? | 1 (never) to 5 (always) | Entry, Exit |
| Anxious | Over the last 30 days, how often have you felt **anxious** at work? | 1 (never) to 5 (always) | Entry, Exit |
| Excited | Over the last 30 days, how often have you felt **excited** at work? | 1 (never) to 5 (always) | Entry, Exit |
| Relaxed | Over the last 30 days, how often have you felt **relaxed** at work? | 1 (never) to 5 (always) | Entry, Exit |
| Frustrated | Over the last 30 days, how often have you felt **frustrated** at work? | 1 (never) to 5 (always) | Entry, Exit |
| Satisfied | Over the last 30 days, how often have you felt **satisfied** at work? | 1 (never) to 5 (always) | Entry, Exit |
| Tired | Over the last 30 days, how often have you felt **tired** at work? | 1 (never) to 5 (always) | Entry, Exit |
| Tired after waking up | I feel tired as soon as I get up in the morning and see a new working day stretched out in front of me. | 1 (never) to 7 (always) | Entry, Exit |
| Self-fulfillment | I have achieved many rewarding objectives at work | 1 (never) to 7 (always) | Entry, Exit |
| Personal growth | I view my work as contributing to my personal growth | 1 (absolutely untrue) to 5 (absolutely true) | Entry, Exit |
| Meaningfulness | I have a good sense of what makes my job meaningful | 1 (absolutely untrue) to 5 (absolutely true) | Entry, Exit |
| Bursting with energy | At work, I feel bursting with energy. | 1 (never) to 7 (always) | Entry, Weekly, Exit |
| Carried away | I get carried away when I am working. | 1 (never) to 7 (always) | Entry, Weekly, Exit |
| Continue long work | I can continue working for very long periods at a time. | 1 (never) to 7 (always) | Entry, Weekly, Exit |
| Eagerness to go to work | When I get up in the morning, I feel like going to work. | 1 (never) to 7 (always) | Entry, Weekly, Exit |
| Forget everything else | When I am working, I forget everything else around me. | 1 (never) to 7 (always) | Entry, Weekly, Exit |
| Happy at intense work | I feel happy when I am working intensely. | 1 (never) to 7 (always) | Entry, Weekly, Exit |
| Stress | At the end of the week, I felt stressed. | 1 (strongly disagree) to 5 (strongly agree) | Weekly |
| Strong and Vigorous | At work, I feel strong and vigorous. | 1 (never) to 7 (always) | Entry, Weekly, Exit |
| Time flies at work | Time flies when I am working. | 1 (never) to 7 (always) | Entry, Weekly, Exit |
| Work detachment difficulty | It is difficult to detach myself from my work. | 1 (never) to 7 (always) | Entry, Weekly, Exit |
| Work immersion | I am immersed in my work. | 1 (never) to 7 (always) | Entry, Weekly, Exit |
| Resilience | At my job, I am very resilient, mentally. | 1 (never) to 7 (always) | Entry, Exit |
| Perseverence | At my work, I always persevere, even when things do not go well. | 1 (never) to 7 (always) | Entry, Exit |
| Learning | I continue to learn more and more as time goes by. | 1 (strongly disagree) to 7 (strongly agree) | Entry, Exit |
| Self-improvement | I see myself continually improving. | 1 (strongly disagree) to 7 (strongly agree) | Entry, Exit |
| Worn out | I feel worn out at the end of a working day. | 1 (never) to 7 (always) | Entry, Exit |
| Focus Time Quantity | For Treatment: How often did you use the Focus blocks set by the focus time plan? For Control: Please look at your calendar for the past 5 work days. How much time in total have you blocked for yourself to focus on heads-down work? | Open Textbox on hours | Weekly, Exit |

we randomly selected a sample of 25 participants (15 for Treatment and 10 for Control). One Treatment and two Control participants dropped out in the first two weeks and were substituted with three other participants (also randomly selected from the same pool of 47 participants). Each participant stayed in the study for a period of six weeks in July and August 2022 and responded to an intake survey, weekly check-in surveys, and an exit survey. The compensation for completing the study included USD $100 for Treatment participants and USD $75 for Control participants. The difference in compensation is based on the notion that the Treatment group was asked to enable and use Focus Time on their calendars in addition to responding to the surveys. Table 1 presents the demographic distribution of the 25 participants who stayed for the entire study.
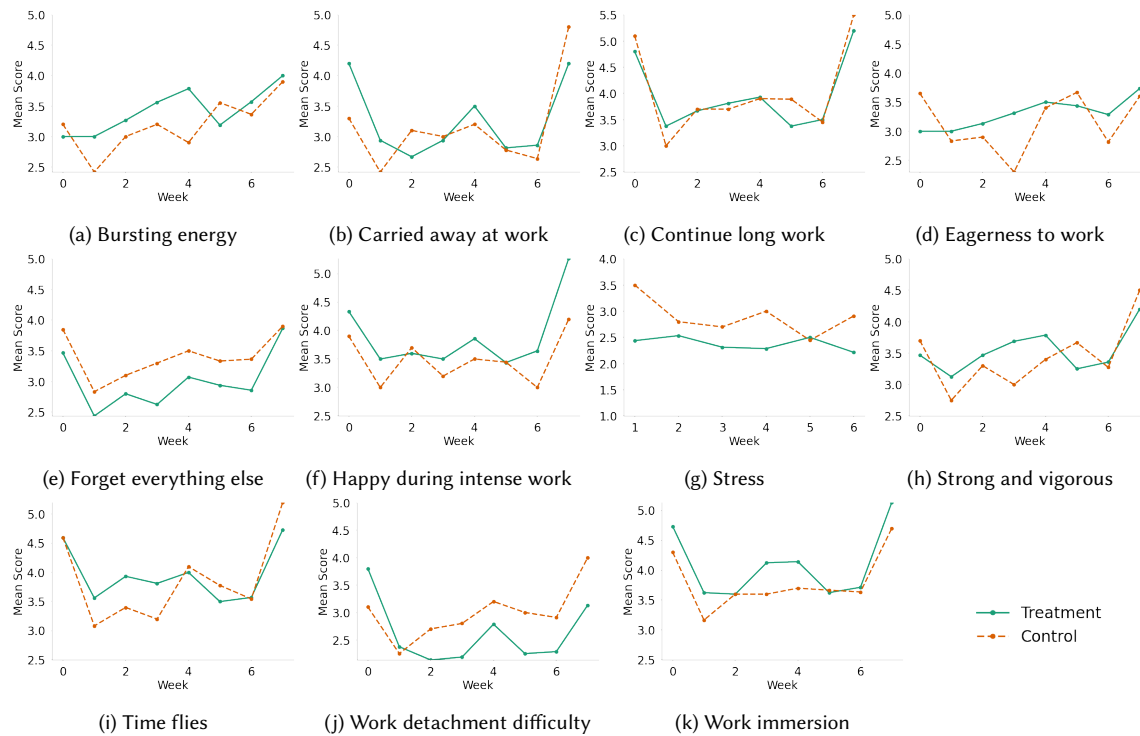
Fig. 2. Comparison of Treatment and Control individuals' weekly changes over the study (week 0 is intake and week 7 is exit).

## 3.3 Self-Reported Surveys

We designed our study to understand the effects of protecting time for focused work on calendars. We employed multiple surveys that measure an individual's wellbeing and engagement at work. These surveys were conducted at the entry (week 0), weekly (week 1 to 6), and exit (week 7) of the study. The surveys administered in week 0 collected baseline data on people's self-perceptions of workplace wellbeing and work engagement factors. The same survey was used in week 6, to see if six weeks of using automatically scheduled focus time for the treatment group resulted in any changes in the same factors. For survey questions, we draw on organizational research in the impact of focused work on eudaimonic wellbeing and workplace engagement-related constructs [1, 16, 19, 62, 88]. We adopted the survey questionnaires from the Utrecht Job Engagement Scale [96], Work and Meaning Inventory [104], and Job-related Affective Wellbeing scale [108]. Table 2 provides the survey questions administered at different stages of the study. The weekly surveys were geared towards understanding how well participants could focus at work that week and a few questions on wellbeing. In addition, the weekly and exit survey questions included qualitative and open-ended questions on what the participants did during the Focus Time periods and their perceived benefits and challenges with the service.

## 4 RESULTS

We examined the changes in workplace wellbeing and engagement measures during the course of the study for the Treatment and Control groups. First, comparing the differences in the two groups during intake of the study, we note that both the groups are well-distributed in demographic parameters (Table 1). We also compared the differences

in the intake survey for the two groups, which could be considered to be their baseline measures (before any study intervention was conducted). We conducted independent sample $t$-tests to compare the differences to find no significant difference across all the measures in Table 2, except a small significant difference in *frustrated* ($t$=2.35, $p$<0.05). The lack of significant differences across the majority of measures at the beginning of the study suggests that we had two balanced groups of individuals. The following subsections report our findings corresponding to each of our research questions.

## 4.1 RQ1: Immediate wellbeing and work engagement changes

Table 3. Summary of differences in wellbeing measures through weekly check-ins during the course of the study for Treatment and Control individuals, along with effect size (Cohen's $d$) and independent-sample $t$-tests (. $p$<0.1, * $p$<0.05, ** p<0.01, ***p<0.001).

| Measure | Treatment | | Control | | $d$ | t-test | Interpretation for Treatment |
|---|---|---|---|---|---|---|---|
| | Mean | Std. | Mean | Std. | | | |
| Bursting /w energy | 3.38 | 0.86 | 3.05 | 0.89 | 0.38 | 2.33** | Treatment felt greater bursting with energy |
| Carried away | 2.95 | 1.08 | 2.84 | 1.17 | 0.09 | 0.57 | |
| Continue long work | 3.60 | 1.06 | 3.58 | 0.87 | 0.02 | 0.15 | |
| Eagerness to go to work | 3.27 | 1.19 | 2.97 | 1.34 | 0.24 | 1.48. | Treatment were more eager to go to work. |
| Forget Everything Else During Work | 2.78 | 1.04 | 3.23 | 0.97 | -0.44 | -2.66*** | Treatment forgot lower about non-work |
| Happy During Intense Work | 3.58 | 0.97 | 3.29 | 0.90 | 0.31 | 1.86. | Treatment were happier during intense work. |
| Stress | 2.38 | 1.08 | 2.92 | 1.29 | -0.45 | -2.77*** | Treatment felt lower stress. |
| Strong and Vigorous | 3.44 | 0.93 | 3.21 | 0.95 | 0.24 | 1.48. | Treatment felt more strong and vigorous. |
| Time Flies | 3.73 | 0.96 | 3.50 | 1.10 | 0.22 | 1.33 | |
| Work Detachment Difficulty | 2.33 | 1.09 | 2.79 | 1.44 | -0.36 | -2.24** | Treatment found it easier to detach from work. |
| Work Immersion | 3.80 | 0.99 | 3.55 | 0.93 | 0.27 | 1.59. | Treatment were more immersed in work. |
| *Work comparison* | | | | | | | |
| Work Hours | 42.36 | 6.91 | 41.69 | 7.60 | 0.09 | 0.56 | |
| Work Hours Deviation from Norm | 1.91 | 0.57 | 1.97 | 0.62 | -0.09 | -0.57 | |
| Focus Time Quantity | 2.60 | 0.57 | 2.34 | 0.76 | 0.39 | 2.45** | Treatment were able to dedicate more time to focus. |

Towards RQ1, we examine how the wellbeing and work engagement measures temporally varied for the participants in each week over the duration of the study. Figure 2 compares the Treatment and Control individuals' weekly responses collected before and during the use of the Focus Time feature for six weeks. Appendix **??** shows the distribution of the responses in the Treatment and Control groups. These comparisons include the entry (week 0) and exit (week 7), wherever applicable. Table 3 shows a summary overview of these changes, including effect size (Cohen's $d$) and independent sample $t$-tests, revealing significant changes in several comparisons.

We find that the Treatment individuals show greater *bursting with energy* ($d$=0.38), *eagerness to go to work* ($d$=0.24), and *work immersion* ($d$=0.27), whereas lower *forgetting everything else during work* ($d$=0.44), *stress* ($d$=0.45), and *difficulty to detach from work* ($d$=0.36). We also note that there was no significant difference in the work hours and the (self-reported) deviation of work hours from typical work hours between the Treatment and Control individuals. So, the directionalities in measures indicate a positive short-term impact every week among the Treatment individuals than the Control individuals. The Treatment individuals also self-reported a better ability to dedicate time for focused work than the Control individuals; this plausibly validates the use of Focus Time—that the Treatment individuals were actually able to use the feature during the study period.

## 4.2 RQ2: Overall Impact of Focus Time on Wellbeing and Work Engagement

To study RQ2, we conduct a within-person examination of how the Treatment participants' wellbeing and work engagement changed at the end of the study compared to the beginning. We quantify the changes from the entry to exit of the study, and measure the average treatment effect (ATE) computed as the mean difference in changes in Treatment and Control groups. Table 4 summarizes the mean within-person changes in the Treatment group, along

Table 4. Summary of within-person changes in wellbeing measures from intake to exit of the study for Treatment individuals, along with Average Treatment Effect (ATE), and paired-sample *t*-tests (. *p*<0.1, * *p*<0.05, ** p<0.01, ***p<0.001). Bar lengths are proportional to ATE magnitude, and for significant rows, **pink** bars indicate **a decrease** in Treatment individuals' measure and **green** bars indicate an **an increase** in Treatment individuals' measure. The interpretations are only provided for statistically significant rows as per *t*-test; Length of grey bars indicate the magnitude of ATE in non-significant rows.

| Measure | Mean $\delta$Tr. | ATE | $d$ | t-test | Interpretation for Treatment individuals |
|---|---|---|---|---|---|
| Angry | -0.53 | -0.48 | 0.61 | 2.26* | Anger decreased |
| Anxious | -0.33 | -0.93 | 0.47 | 1.16 | |
| Excited | 0.73 | 0.93 | -0.92 | -2.13* | Excitement increased |
| Relaxed | 0.60 | 0.70 | -0.95 | -3.67*** | Relaxation increased |
| Frustrated | -0.47 | -0.52 | 0.75 | 2.82** | Frustration decreased |
| Satisfied | 0.47 | 0.47 | -0.51 | -2.43* | Satisfaction increased |
| Tired | -0.47 | -0.67 | 0.67 | 2.17* | Tiredness decreased |
| Bursting /w energy | 1.00 | 0.30 | -0.91 | -3.62*** | Bursting with energy increased |
| Carried away | 0.00 | 0.02 | 0.00 | 0.00 | |
| Continue long work | 0.40 | 0 | -0.24 | -0.81 | |
| Eagerness to go to Work | 0.73 | 0.78 | -0.48 | -1.98. | Eagerness to go to work increased |
| Forget everything else | 0.40 | 0.35 | -0.25 | -1.19 | |
| Happy during intense work | 0.93 | 0.63 | -0.66 | -1.79. | Happiness during intense work increased |
| Time flies during work | 0.13 | -0.47 | -0.09 | -0.32 | |
| Learning | 0.07 | 0.32 | -0.05 | -0.17 | |
| Meaningfulness | 0.20 | -0.30 | -0.16 | -0.61 | |
| Perseverance | 0.20 | -0.45 | -0.23 | -0.76 | |
| Personal growth | 0.40 | 0.50 | -0.29 | -1.38 | |
| Resilience | 0.87 | 0.67 | -0.62 | -2.48* | Resilience increased |
| Self-fulfilment | 0.47 | 0.52 | -0.33 | -1.61 | |
| Self-improvement | -0.20 | -0.30 | 0.15 | 0.51 | |
| Strong and vigorous | 0.73 | 0.07 | -0.71 | -2.05* | Feeling strong and vigorous increased |
| Tired after waking up | -0.93 | -1.03 | 0.61 | 1.90. | Feeling tired after waking up decreased |
| Work detachment difficulty | -0.67 | -1.57 | 0.35 | 1.01 | |
| Work immersion | 0.40 | 0 | -0.25 | -1.87 | |
| Worn out | -0.27 | -0.22 | 0.19 | 0.55 | |
| Working too hard | -0.13 | -0.93 | 0.08 | 0.31 | |

with the ATE, Cohen's *d*, and paired-sample *t*-tests. Among affect categories, we find that the Treatment individuals show lowered *anger*, *frustration*, and *tiredness* and increased *excitement*, *relaxation*, and *satisfaction*. Additionally, the Treatment group also got benefited from increased *energy*, *eagerness to go to work*, *happiness during intense work*, and *resilience*, and decreased *feeling tired after waking up*. The other positive changes are hard to be confirmed due to the lack of significance. Overall, we find significant positive results in how the Treatment individuals showed longer-term wellbeing improvements at the end of the six-weeks study.

### 4.3 RQ3: Use, benefits, and challenges of scheduling focus time

Finally, for RQ3, we examine the qualitative and open-ended components of our surveys to understand how was Focus Time used during the study. In the following paragraphs, we report our findings on the use and perceived benefits and challenges of Focus Time.

***What people do during Focus Time?*** The weekly surveys asked the participants, "Out of the booked focus time on your calendar, please check which of the following you recall using it for (select all that apply." Table 5 shows the distribution of activities that people chose; we find that participants used the feature for several purposes, with maximum responses about focused deep work, catching up on backlogged work, and email and communications. We also followed this question with "Think about the previous question. Did you plan your activity during the focus time periods?", to which the responses were *yes* (23),

Table 5. Activities and counts of self-reported responses received of using Focus Time periods.

| | |
|---|---|
| Focused deep work | 69 |
| Personal errands | 22 |
| Exercise | 21 |
| Taking a break | 41 |
| Email and communications | 61 |
| Catching up on backlogged work | 62 |
| Other | 0 |

*somewhat* (53), and *no* (15). This indicates that there are several instances that activities during Focus Time can be unplanned or unanticipated apriori.

**Need of Focus Time.** The exit reflection survey asked the Treatment participants about their likelihood to continue using Focus Time, to which 13 participants responded positively (5 responded *extremely likely* and 2 responded *quite likely*), and 2 responded negatively (1 responded *unlikely* and 1 responded *extremely unlikely*). We also asked the Control participants about their desire to use an automated service that could help block times on their calendars on a scale of 1 (I do not want it at all) to 5 (I would very much like to have it), where the average response is 3.4, showing a slight inclination towards the desire to such a service.

**Benefits of Focus Time.** We asked the Treatment participants about the benefits of having Focus Time on their calendars. A majority of the responses included participants' appreciation for self-time on calendars, and not being disrupted by others booking times for meetings. One participant expressed, "It forced me to keep a block of time open for "me". I mean that it won't let me book my whole day up and not give me time to do the things I need to do."

Another participant described the feature as a "safe haven": "It's so nice to be able to get away from constant meetings. Calendar blocks feel like a safe haven from having to listen to people ask for more and more of your time. It's also so nice to be able to work through a to-do list and actually see the amount I have left to do go down." Similarly, people reflected on minimizing distractions and being able to do focused work: "Teammates will not book meetings at that time. I know I can get time to do what I need to get done without distractions. I feel more relaxed at this time."

**Challenges of Focus Time.** Treatment participants responded to what are the drawbacks and challenges of using Focus Time, where we got a variety of responses. Participants were concerned about the misalignment in the actual and their necessary scheduling of time to focus. Two participants expressed that Focus Time schedule might not always coincide with their readiness to focus, such as one expressed: "I felt that the focus time came up so quickly some days that I wasn't prepared to take it at that specific time. I felt that the focus time was too short as well."

Two participants expressed the challenge that others would still be able to book meetings during their Focus Time, and two found it challenging that they had to sometimes schedule meetings during Focus Time: "The challenge of having time blocked is I was not always able to utilize the focus time due to scheduling conflicts."

Five participants expressed that they would like some transparency with specific team members so that they can schedule high-priority meetings even during focus time. A participant was not happy that they were not alerted about the meetings booked during focus time and how they "accidentally missed a meeting with their boss." Similarly, participants also expressed they would like more control over the feature and the ability to personalize what notifications they block or receive during Focus Time, such as, one participant expressed: "I like having time blocked but I disliked the computer doing it for me. I want to do it at different times for different durations vs. ceding control of my calendar."

**What can be improved for Focus Time?** Finally, we asked the participants if they would like specific things to be improved for Focus Time. Related to the drawbacks expressed above, a majority of the responses were about the desire for more control and the ability to select Focus Time, in terms of scheduling Focus Time at the start of every week and the ability to control the notifications from specific individuals, such as: "I wish I could grant access to a few people to book time during my focus time. But just a few people and blocked off from the others."

Multiple participants also desired for a better visual identifier for Focus Time which is different from "available" and "busy" status on internal communication platform (Teams) and email (outlook) interface: "Come up with an easily identified universal visual indication of focus time, whether that's a color, a line shape, or something like that, so that it is easily identified at a glance by all users."

## 5 DISCUSSION

### 5.1 Theoretical Implications

Our work adds to the body of literature on time management of information workers (see Related Work, Section 2). This study provides empirical insights into the effectiveness of a computing-assisted time protection service (Focus Time) in scheduling time to focus, and how that impacts the eudaimonic wellbeing and work engagement of information workers. The findings largely support prior research about the expected efficacy of digitally protecting time, including how dedicating time to oneself without being disrupted by notifications can help improve a worker's stress levels, wellbeing, and productivity [28, 72, 73]. Our findings also align with Das Swain et al.'s study that a Focus Time service can help minimize distractions due to synchronous communication at work and help information workers rearrange their work better, effectively reducing their workload and improving their wellbeing.

Our study suggests heterogeneity in characterizing "focus" in Focus Time—we received varying responses across focused deep work, personal errands, exercise, taking a break, emails, and catching up with backlogged work. It is plausible that focus time can also be used in other ways depending on the needs and desires of a worker and a specific situation. This motivates further research into understanding how self-focus time is used. Our findings reveal new insights into how the definition of "focused work" may have evolved over changing work settings—Mark et al. noted that focused work is associated with higher stress. However, our findings reveal that information workers' stress is reduced after using Focus Time. We situate this observation with how shorter focus, task switching, and multitasking can often overwhelm and cause stress [72]. It is interesting to note that even though Focus Time could be considered to be a service that supports cognitive aspects at work, we find that this can also benefit wellbeing and related emotional and social constructs.

### 5.2 Practical and Design Implications

This work bears practical implications in designing and building tools that programmatically help the time management of information workers. These services are even more relevant with the increasing prevalence of remote and hybrid work, as well as blurred boundaries between personal and professional lives. While our findings note that such a service can help the wellbeing and work engagement, we also found the use case, existing challenges, and potential improvements of such a service.

We found that some participants desired more control in scheduling Focus Time, and some expressed the misalignment between when they want and when the system schedules Focus Time. This motivates building tools accounting for both user control and semi-automated personalized approaches leveraging user behaviors and context (as seen in [78, 92]). Additionally, dedicating time for focus work might seem too generic, and individuals may not realize the purpose of these periods (as also observed in our study). This calls for designing and evaluating tools that are more specific with recommendations on how a user could use the time (e.g., recommending "exercise time", "email communications time").

Along the lines of the above, participants noted how they encountered the focus time on their schedule somewhat unexpectedly and unplanned. This calls for integrating the Focus Time feature with more self-reflection and self-planning opportunities; for example, individuals are sent their upcoming Focus Time schedules in advance, along with possible recommendations for better using the feature. Again, participants may have been unaware of the need or effectiveness of such a feature. Findings, such as that from our study and other research [31], on the benefits of computer-assisted protected time, can serve as scientific evidence to motivate participants about using the feature better and making the best use of it.

While this study was specifically about focus work features on work devices, there are similar features on other devices, such as smartphones that block notifications during specific times of the day (e.g., during sleep or focused work). It would be interesting to examine the effectiveness of such features on digital wellbeing and optimized time use.

## 5.3 Ethical and Policy Implications

Our work found the challenges individuals faced with using Focus Time. While these challenges and mitigation strategies not only provide new insights into designing Focus Time-related features but also opens up new discussions on how better transparency, awareness, and explainability about the feature could help prevent some of the concerns, borrowing from anticipatory ethics research [3, 13]. For instance, can we think of information guides that come with these tools which not only inform the users about the information and use case about the technology but also the likely "side-effects" of using the technologies, such as how these are described in medication guides that come with prescription drugs? Future research can also evaluate the effectiveness of these approaches.

This work also bears organizational and policy-facing implications, especially showing how productivity and wellbeing benefits are intertwined. Our work provides empirical insights into how dedicating time to an individual's focused work can help them improve their wellbeing. Therefore, organizations can also include dedicated, focused time work as a part of the employees' work schedules. This can be along the lines of what organizations have recently been exploring the policies of no-meeting day, no-meeting week, and flexible work-week to enhance worker wellbeing [60, 102]. Further, we observed that participants expressed challenges that others would still schedule meetings during Focus Time or they would feel the necessity to prioritize meetings over focused work during these periods. Some of these practices may not necessarily be technology-driven but rather systemic—organizations can promote culture and norms of respecting each others' focus times to facilitate a thriving environment. Together, these approaches can help workers to manage their workload better as well as be happier and more productive at work.

It would be interesting to examine if features such as Focus Time can be gamified. Employers can be worried that workers might misuse these features for "me-time" when they are on their employers' time and evade work-related responsibilities. In fact, employers can build these features to gather more transparency about what employees do during Focus Time periods. However, such tools will cause workplace surveillance and bossware-related concerns [5, 14]. In addition, recent research has critically questioned the applicability of different digital and sensing technologies in the workplace [25, 26, 30, 41, 51]. These challenges span across employee privacy concerns, misalignments in expectations and outcomes, and other bias issues. Therefore, navigating these tensions between employee privacy and employer transparency requirements remains important. This work motivates research in gathering multi-stakeholder perspectives about these technologies from organizational leaders, HR and policymakers, AI builders, and worker data subjects, and co-designing exercises of what improvements can be made with features such as Focus Time.

## 5.4 Limitations and Future Directions

While the findings are promising, we acknowledge that our pool is small (25), for a short duration (six weeks), and limited to U.S. information workers. Therefore, we cannot make conclusive generalizability claims. Our study is also not immune to novelty effects [56], i.e., it is possible that the participants found the feature to be exciting and used it during the course of the study. It was interesting that participants did not complain about the burden of using a service, an expected issue in the design and deployment of new HCI tools [66]. However, the long-term user burden and acceptance of the feature remains unknown [49]. Therefore, our work motivates future research in evaluating the effectiveness on a larger scale and longer duration. While it was out of scope from the current study, we also noted some

positive improvements in the Control individuals, which could be attributed to the advantages of personal journaling and self-reflections [6, 106] that these participants periodically did when responding to weekly surveys. In addition, our participants may have been subjected to observer effect [87] and our study likely suffers from self-selection biases—we only studied participants willing to use Focus Time and participate in the study. Studies through passive sensing could be a means to mitigate some of these limitations. However, such research or real-world experiments could raise ethical and privacy-related concerns [50]. This provokes discussion in designing research that balances privacy-related concerns but obtains holistic findings about the need and efficacy of such computing-assisted technologies at workplaces.

## 6   CONCLUSION

We examined the effectiveness of a computer-assisted protected time service, Viva Focus Time on Outlook calendars, which automatically schedules time for focused work on people's work calendars. We conducted an experimental study over six weeks with 15 Treatment individuals who were asked to use the Focus Time service and 10 Control individuals who did not use the service. The participants responded to survey questions on eudaimonic wellbeing and work engagement throughout the study. We found that the Treatment participants showed significantly higher wellbeing and work engagement both temporally over the weeks, as well as in the long-term at the end of the study compared to the beginning. In particular, the Treatment participants showed increased excitement, relaxation, and satisfaction, and decreased anger, frustration, tiredness, and stress. We also studied the needs, benefits, and challenges of scheduling focus time. While participants realized the benefits of the service, but they also sought more control in scheduling their focus time as per convenience. This study provides empirical evidence about the importance of enabling mechanisms to support focused work and bears implications for designing tools for supporting focused work.

## ACKNOWLEDGMENTS

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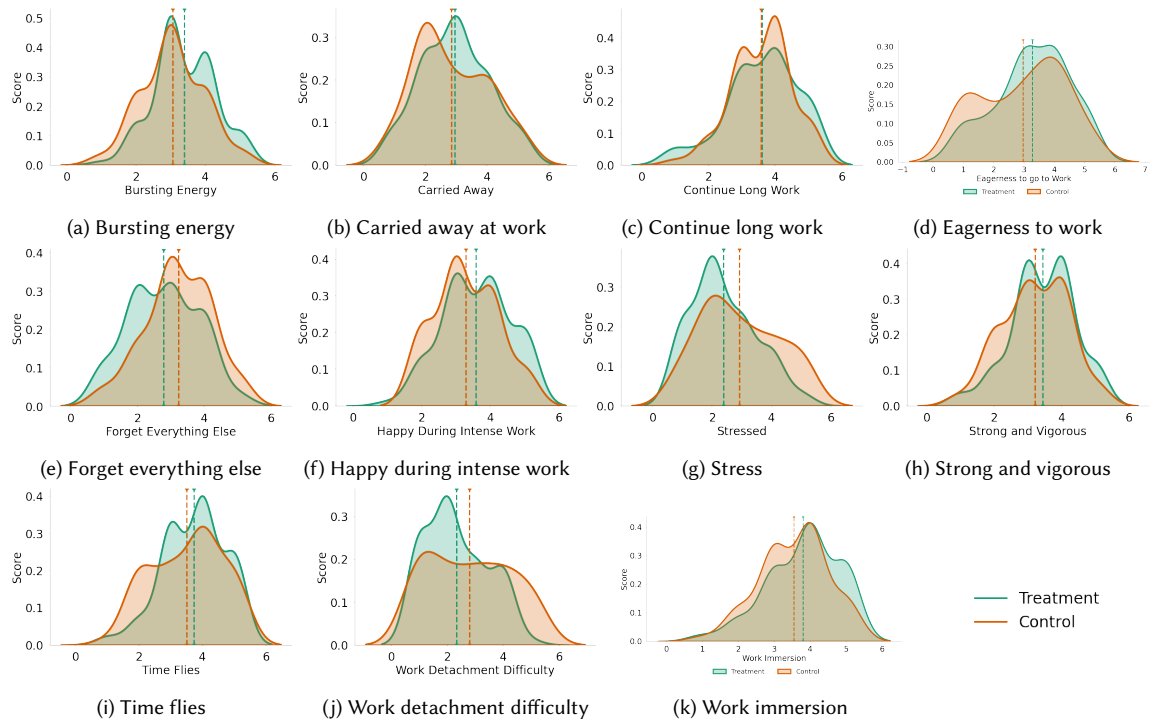
## 7  APPENDIX



Fig. A1. Comparison of Treatment and Control individuals' distribution of responses. Dotted lines represent the mean of the distribution of respective color.