

Focus Time for Wellbeing and Work Engagement of Information Workers

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ABSTRACT

Having little time for focused work is a major challenge in information work. While research has explored computing-assisted user-facing solutions for protecting time for focused work, there is limited empirical evidence about the 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 conducted 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 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 and design recommendations for enabling mechanisms and tools supporting focused work.

CCS CONCEPTS

• **Human-centered computing** → *Empirical studies in ubiquitous and mobile computing; Empirical studies in collaborative and social computing*; • **Applied computing** → *Psychology*.

KEYWORDS

focus work, time protection, work engagement, workplace wellbeing, experimental study

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1 INTRODUCTION AND BACKGROUND

Managing time better at workplaces is one of the key interests of researchers and practitioners [16]. Workplaces have forever been evolving, and recently, we have seen an increasing prevalence of remote and hybrid work as stimulated by the COVID-19 pandemic [15, 49]. While such work settings have enabled more flexibility and remote collaborations for information work [56],

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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 [15, 28, 46]. These complexities have simultaneously added limits to an individual's ability and time to do self-focused work, and affected wellbeing [11, 51]. Prior work has noted the costs of task switching and disruptions due to notifications towards depleted productivity and wellbeing [5, 13, 21, 29, 32, 37]. 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 [34, 38]. Research has also noted the importance of focused work in improving productivity and wellbeing [14, 19, 34, 43]. Focused work is found to associate with cognitive absorption, which not only significantly impacts an individual's deep involvement, learning [1], and creativity [9], but also helps them be more relaxed and perceive greater control [31, 42].

To help individuals dedicate more time to focused work, HCI research has explored methods such as better notifications, time-protection tools, and other interventions [10, 17, 20, 22, 25, 27, 53]. 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 [8]. 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 workplace wellbeing measures before and after the study. We also compared the Treatment group with a Control group that did not use Focus Time 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 showed also 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 workers to set aside time to focus on their calendars to improve overall long-term wellbeing and productivity of the 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 feature.

2 STUDY AND METHODS

2.1 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 the Viva Focus Time [40] 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 scheduling up to four hours daily 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. **Figure 1** shows example figures of configuring Focus Time on someone’s outlook calendar. For the study, we asked individuals who had not used the service before to use it to schedule a time to focus on their calendar and see if such a computing-assisted time protection feature would help their wellbeing and work engagement.

2.2 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 [55], 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

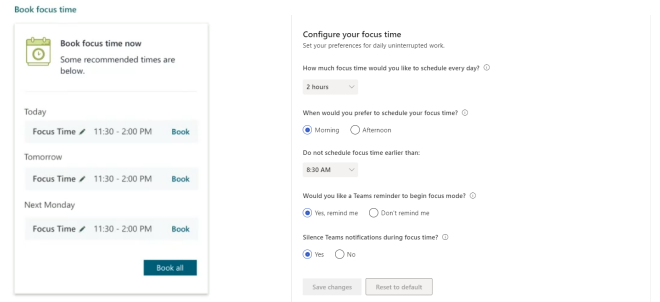


Figure 1: Example figures to demonstrate configuring and using Focus Time feature on Outlook calendar.

Table 1: Demographic distribution of 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, Automotive: 2, Technology: 1, Sales: 1, Consulting: 1, Real Estate: 1, Service: 1, Healthcare: 1	Financial: 3, Healthcare: 2, Technology: 2, Manufacturing: 2, Legal: 1

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, 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. **Table 1** presents the demographic distribution of the 25 participants who stayed for the entire study duration.

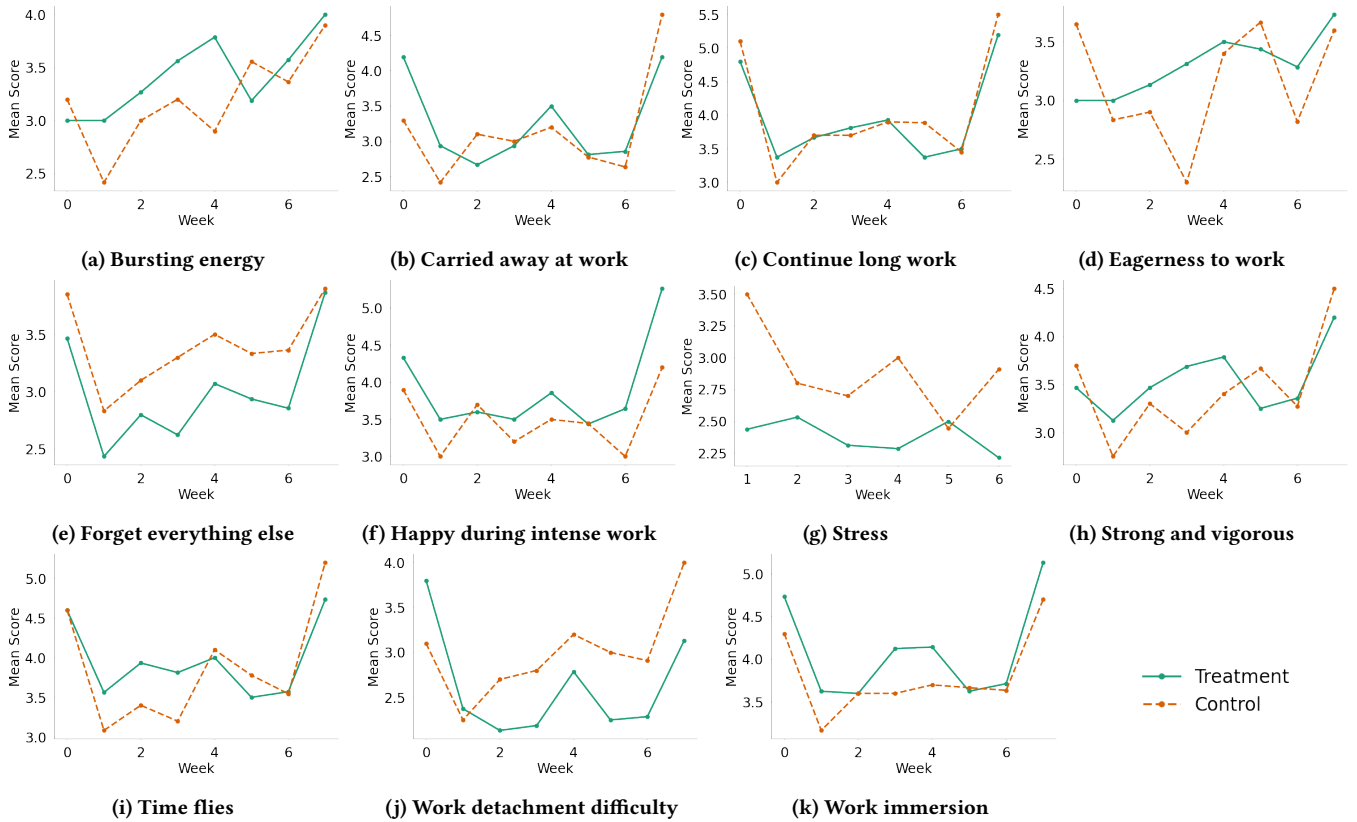


Figure 2: Treatment and Control individuals' weekly changes over the study (week 0 is intake and week 7 is exit).

2.3 Self-Reported Surveys

We designed our study not to ask for specific feedback for the tool used by participants but to understand the effects of protecting time for focused work on their 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 their workplace wellbeing and work engagement factors. The same survey questions were asked during exit, 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 drew on organizational research on the impact of focused work on eudaimonic wellbeing and workplace engagement-related constructs [1, 8, 9, 31, 42]. We adopted the survey questionnaires from the Utrecht Job Engagement Scale [47], Work and Meaning Inventory [50], and Job-related Affective Wellbeing scale [54]. A1 in Appendix provides the survey questions administered at different stages of the study. The weekly check-in 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 survey questions on what the participants did during the Focus Time periods and their perceived benefits and challenges with the feature.

3 FINDINGS

We examine the changes in the wellbeing 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 compare 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 conduct independent sample t -tests to compare the differences to find no significant difference across all the measures in Table A1, except the 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.

3.1 How did wellbeing measures vary weekly?

Towards RQ1, we examine the temporal changes in the measures over the duration of the study (Figure 2), comparing Treatment and Control individuals' weekly responses collected before and during the use of Focus Time feature for six weeks. These comparisons include the entry (week 0) and exit (week 6), wherever applicable. Table 2 shows a summary overview of these changes, including effect size (Cohen's d) and independent sample t -tests, revealing significant changes in a number of comparisons. We find that the Treatment individuals show greater *bursting with*

Table 2: 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.
<i>Work comparison</i>							
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.

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 are indicative of 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.

3.2 How wellbeing measures changed at the end of the study compared to the beginning?

To study RQ2, we conduct a within-person examination of 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 3 summarizes the within-person changes, along with ATE 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 with 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.

3.3 How was Focus Time used during the study?

Finally, for RQ3, we examine the qualitative and open-ended survey components. The following paragraphs 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 4 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), *somewhat* (53), and *no* (15). This indicates that there are several instances that activities during Focus Time can be unplanned or unanticipated a priori.

Table 4: Activities and quantity of self-reported responses received 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

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

Table 3: 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 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 δ 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 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	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	

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.”

4 DISCUSSION AND CONCLUSION

4.1 Implications

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. Our findings show promising evidence of how such a service improves worker wellbeing. The findings largely support prior research about the efficacy of digital time protection, including how dedicating time to oneself without notification disruptions can help improve a worker’s

stress levels, wellbeing, and engagement [13, 14, 36, 37]. Our study suggests heterogeneity in characterizing “focus” in Focus Time—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 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 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 [12, 39, 44]). 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”).

Our work also noted 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 [2, 6]. For instance, can we think of information guides that come with these tools which not only inform the users about the information and usecase 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? It would be interesting to study if such approaches could help prevent some of the potential challenges.

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 [30, 48]. 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 manage their workload better and 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 could misuse these features for “me-time” when they are on their employers’

time and evade work-related responsibilities. 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 [3, 7, 18, 45]. It remains essential to navigate these tensions between employee privacy and employer transparency needs. Therefore, this work motivates 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 services such as Focus Time. 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.

4.2 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 [26], i.e., it is possible that the participants found the feature exciting and used it during the study. Interestingly, participants did not complain about the burden of using a service, an expected issue in the design and deployment of new HCI tools [33]. However, the long-term user burden and acceptance of the feature remains unknown [23]. 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 [4, 52] that these participants periodically did when responding to weekly surveys. In addition, our participants may have been subjected to observer effect [41] 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 [24]. 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.

REFERENCES

- [1] Ritu Agarwal and Elena Karahanna. 2000. Time flies when you’re having fun: Cognitive absorption and beliefs about information technology usage. *MIS quarterly* (2000), 665–694.
- [2] Matthew Arnold, Rachel KE Bellamy, Michael Hind, Stephanie Houde, Sameep Mehta, Aleksandra Mojsilović, Ravi Nair, K Natesan Ramamurthy, Alexandra Olteanu, David Piorkowski, et al. 2019. FactSheets: Increasing trust in AI services through supplier’s declarations of conformity. *IBM Journal of Research and Development* 63, 4/5 (2019), 6–1.
- [3] Kirstie Ball. 2021. Electronic Monitoring and Surveillance in the Workplace. *Publications Office of the European Union, Luxembourg*, doi 10 (2021), 5137.
- [4] Eric PS Baumer, Vera Khovanskaya, Mark Matthews, Lindsay Reynolds, Victoria Schwanda Sosik, and Geri Gay. 2014. Reviewing reflection: on the use of reflection in interactive system design. In *Proceedings of the 2014 conference on Designing interactive systems*. 93–102.
- [5] Piotr Bialowolski, Eileen McNeely, Tyler J VanderWeele, and Dorota Weziak-Bialowolska. 2020. Ill health and distraction at work: Costs and drivers for productivity loss. *Plos one* 15, 3 (2020), e0230562.

- [6] Margarita Boyarskaya, Alexandra Olteanu, and Kate Crawford. 2020. Overcoming failures of imagination in AI infused system development and deployment. *arXiv preprint arXiv:2011.13416* (2020).
- [7] danah boyd and Kate Crawford. 2012. Critical questions for big data: Provocations for a cultural, technological, and scholarly phenomenon. *Information, communication & society* 15, 5 (2012), 662–679.
- [8] Steven P Brown. 1996. A meta-analysis and review of organizational research on job involvement. *Psychological bulletin* 120, 2 (1996), 235.
- [9] Aldijana Bunjak, Matej Černe, and Aleš Popovič. 2021. Absorbed in technology but digitally overloaded: Interplay effects on gig workers' burnout and creativity. *Information & Management* 58, 8 (2021), 103533.
- [10] Scott A Cambo, Daniel Avrahami, and Matthew L Lee. 2017. BreakSense: Combining physiological and location sensing to promote mobility during work-breaks. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*. 3595–3607.
- [11] Hancheng Cao, Chia-Jung Lee, Shamsi Iqbal, Mary Czerwinski, Priscilla NY Wong, Sean Rintel, Brent Hecht, Jaime Teevan, and Longqi Yang. 2021. Large scale analysis of multitasking behavior during remote meetings. In *Proc. CHI*.
- [12] Farhan Asif Chowdhury, Yozen Liu, Koustuv Saha, Nicholas Vincent, Leonardo Neves, Neil Shah, and Maarten W Bos. 2021. CEAM: the effectiveness of cyclic and ephemeral attention models of user behavior on social platforms. In *Proceedings of the international AAAI conference on web and social media*.
- [13] Mary Czerwinski, Eric Horvitz, and Susan Wilhite. 2004. A diary study of task switching and interruptions. In *Proceedings of the SIGCHI conference on Human factors in computing systems*. 175–182.
- [14] Vedant Das Swain, Javier Hernandez, Brian Houck, Koustuv Saha, Jina Suh, Ahad Chaudhry, Tenny Cho, Wendy Guo, Shamsi Iqbal, and Mary Czerwinski. 2023. Focused Time Saves Nine: Evaluating Computer-Assisted Protected Time for Hybrid Information Work. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*.
- [15] Vedant Das Swain, Koustuv Saha, Gregory D Abowd, and Munmun De Choudhury. 2020. Social media and ubiquitous technologies for remote worker wellbeing and productivity in a post-pandemic world. In *2020 IEEE Second International Conference on Cognitive Machine Intelligence (CogMI)*. IEEE, 121–130.
- [16] Edeltraud Egger and Ina Wagner. 1992. Time-Management: A Case for CSCW. In *Proceedings of the 1992 ACM Conference on Computer-Supported Cooperative Work* (Toronto, Ontario, Canada) (CSCW '92). New York, NY, USA.
- [17] Daniel A Epstein, Daniel Avrahami, and Jacob T Biehl. 2016. Taking 5: Work-breaks, productivity, and opportunities for personal informatics for knowledge workers. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*. 673–684.
- [18] Saby Ghoshray. 2013. Employer surveillance versus employee privacy: The new reality of social media and workplace privacy. *N. Ky. L. Rev.* 40 (2013), 593.
- [19] Ted Grover, Kael Rowan, Jina Suh, Daniel McDuff, and Mary Czerwinski. 2020. Design and evaluation of intelligent agent prototypes for assistance with focus and productivity at work. In *Proceedings of the 25th International Conference on Intelligent User Interfaces*. 390–400.
- [20] Esther Howe, Jina Suh, Mehrab Bin Morshed, Daniel McDuff, Kael Rowan, Javier Hernandez, Marah Ihab Abidin, Gonzalo Ramos, Tracy Tran, and Mary P Czerwinski. 2022. Design of Digital Workplace Stress-Reduction Intervention Systems: Effects of Intervention Type and Timing. In *CHI Conference on Human Factors in Computing Systems*. 1–16.
- [21] Shamsi T Iqbal and Eric Horvitz. 2007. Disruption and recovery of computing tasks: field study, analysis, and directions. In *Proceedings of the SIGCHI conference on Human factors in computing systems*. 677–686.
- [22] Shamsi T Iqbal and Eric Horvitz. 2010. Notifications and awareness: a field study of alert usage and preferences. In *Proceedings of the 2010 ACM conference on Computer supported cooperative work*. 27–30.
- [23] Bahar Irfan, Aditi Ramchandran, Samuel Spaulding, Dylan F Glas, Iolanda Leite, and Kheng Lee Koay. 2019. Personalization in long-term human-robot interaction. In *2019 14th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. IEEE, 685–686.
- [24] Jukka Jouhki, Epp Lauk, Maija Penttinen, Niina Sormanen, and Turo Uskali. 2016. Facebook's emotional contagion experiment as a challenge to research ethics. *Media and Communication* 4 (2016).
- [25] Everlyne Kimani, Kael Rowan, Daniel McDuff, Mary Czerwinski, and Gloria Mark. 2019. A conversational agent in support of productivity and wellbeing at work. In *2019 8th international conference on affective computing and intelligent interaction (ACII)*. IEEE, 1–7.
- [26] Michael Koch, Kai von Luck, Jan Schwarzer, and Susanne Draheim. 2018. The novelty effect in large display deployments—Experiences and lessons-learned for evaluating prototypes. In *Proceedings of 16th European conference on computer-supported cooperative work-exploratory papers*. European Society for Socially Embedded Technologies (EUSSET).
- [27] Seyma Kucukozer-Cavdar, Tugba Taskaya-Temizel, Abhinav Mehrotra, Mirco Musolesi, and Peter Tino. 2021. Designing Robust Models for Behaviour Prediction Using Sparse Data from Mobile Sensing: A Case Study of Office Workers' Availability for Well-being Interventions. *ACM Transactions on Computing for Healthcare* 2, 4 (2021), 1–33.
- [28] Andrew Kun, Orit Shaer, and Shamsi Iqbal. 2021. The Future of Work: COVID-19 and Beyond. *IEEE Pervasive Computing* 20, 04 (2021), 7–8.
- [29] Kostadin Kushlev and Elizabeth W Dunn. 2015. Checking email less frequently reduces stress. *Computers in Human Behavior* 43 (2015), 220–228.
- [30] Ben Laker, Vijay Pereira, Pawan Budhwar, and Ashish Malik. 2022. The surprising impact of meeting-free days. *MIT Sloan Management Review* (2022).
- [31] Pierre-Majorique Léger, Fred D Davis, Timothy Paul Cronan, and Julien Perret. 2014. Neurophysiological correlates of cognitive absorption in an enactive training context. *Computers in Human Behavior* 34 (2014), 273–283.
- [32] Kevin P Madore, Anna M Khazenon, Cameron W Backes, Jiefeng Jiang, Melina R Uncapher, Anthony M Norcia, and Anthony D Wagner. 2020. Memory failure predicted by attention lapsing and media multitasking. *Nature* 587, 7832 (2020), 87–91.
- [33] Nikola Marangunić and Andrina Granić. 2015. Technology acceptance model: a literature review from 1986 to 2013. *Universal access in the information society* 14, 1 (2015), 81–95.
- [34] Gloria Mark, Shamsi Iqbal, and Mary Czerwinski. 2017. How blocking distractions affects workplace focus and productivity. In *Proceedings of the 2017 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2017 ACM International Symposium on Wearable Computers*. 928–934.
- [35] Gloria Mark, Shamsi T Iqbal, Mary Czerwinski, and Paul Johns. 2014. Bored Mondays and focused afternoons: The rhythm of attention and online activity in the workplace. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM, 3025–3034.
- [36] Gloria Mark, Shamsi T Iqbal, Mary Czerwinski, Paul Johns, and Akane Sano. 2016. Neurotics can't focus: An in situ study of online multitasking in the workplace. In *Proceedings of the 2016 CHI conference on human factors in computing systems*. 1739–1744.
- [37] Gloria Mark, Shamsi T Iqbal, Mary Czerwinski, Paul Johns, Akane Sano, and Yuliya Lutchyn. 2016. Email duration, batching and self-interruption: Patterns of email use on productivity and stress. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*. ACM, 1717–1728.
- [38] Gloria Mark, Stephen Volda, and Armand Cardello. 2012. "A pace not dictated by electrons" an empirical study of work without email. In *Proceedings of the SIGCHI conference on human factors in computing systems*. 555–564.
- [39] Abhinav Mehrotra, Fani Tsapeli, Robert Hendley, and Mirco Musolesi. 2017. MyTraces: Investigating correlation and causation between users' emotional states and mobile phone interaction. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* 1, 3 (2017), 1–21.
- [40] Microsoft. 2023. Focus plan, Microsoft Viva Insights. <https://learn.microsoft.com/en-us/viva/insights/personal/use/focus-plan>. Accessed: 2023-01-19.
- [41] David Oswald, Fred Sherratt, and Simon Smith. 2014. Handling the Hawthorne effect: The challenges surrounding a participant observer. *Review of social studies* 1, 1 (2014), 53–73.
- [42] Iris Reyachav and Dezhi Wu. 2015. Are your users actively involved? A cognitive absorption perspective in mobile training. *Computers in Human Behavior* 44 (2015), 335–346.
- [43] Daniel Russo, Paul HP Hanel, Seraphina Altnickel, and Niels van Berkel. 2021. Predictors of well-being and productivity among software professionals during the COVID-19 pandemic—a longitudinal study. *Empirical Software Engineering* 26, 4 (2021), 1–63.
- [44] Koustuv Saha, Yozen Liu, Nicholas Vincent, Farhan Asif Chowdhury, Leonardo Neves, Neil Shah, and Maarten W Bos. 2021. AdverTiming Matters: Examining User Ad Consumption for Effective Ad Allocations on Social Media. In *Proc. CHI*.
- [45] Koustuv Saha, Manikanta D Reddy, Stephen Mattingly, Edward Moskal, Anusha Sirigiri, and Munmun De Choudhury. 2019. Libra: On linkedin based role ambiguity and its relationship with wellbeing and job performance. *Proceedings of the ACM on Human-Computer Interaction* 3, CSCW (2019), 1–30.
- [46] Advait Sarkar, Sean Rintel, Damian Borowiec, Rachel Bergmann, Sharon Gillett, Danielle Bragg, Nancy Baym, and Abigail Sellen. 2021. The promise and peril of parallel chat in video meetings for work. In *Extended Abstracts of the 2021 CHI Conference on Human Factors in Computing Systems*. 1–8.
- [47] Wilmar B Schaefeli, Arnold B Bakker, and Marisa Salanova. 2003. Utrecht work engagement scale-9. *Educational and Psychological Measurement* (2003).
- [48] David A Shore. 2013. Fewer. Shorter. Better: Effective and efficient meetings for higher performing organizations. *Journal of health communication* 18, 11 (2013), 1275–1278.
- [49] Danijela Sokolic. 2022. Remote work and hybrid work organizations. *Economic and social development: Book of proceedings* (2022), 202–213.
- [50] Michael F Steger, Bryan J Dik, and Ryan D Duffy. 2012. Measuring meaningful work: The work and meaning inventory (WAMI). *Journal of career Assessment* 20, 3 (2012), 322–337.
- [51] Shaun Subel, Martin Stepanek, and Thomas Roulet. 2022. How shifts in remote behavior affect employee well-being. *MIT Sloan Management Review* 63, 3 (2022), 1–6.
- [52] Alice Thudt, Uta Hinrichs, Samuel Huron, and Sheelagh Carpendale. 2018. Self-reflection and personal physicalization construction. In *Proceedings of the 2018*

- CHI Conference on Human Factors in Computing Systems*. 1–13.
- [53] Vincent W-S Tseng, Matthew L Lee, Laurent Denoue, and Daniel Avrahami. 2019. Overcoming distractions during transitions from break to work using a conversational website-blocking system. In *Proceedings of the 2019 CHI conference on human factors in computing systems*. 1–13.
- [54] Paul T Van Katwyk, Suzy Fox, Paul E Spector, and E Kevin Kelloway. 2000. Using the Job-Related Affective Well-Being Scale (JAWS) to investigate affective responses to work stressors. *Journal of occupational health psychology* 5, 2 (2000), 219.
- [55] Michael Winnick. 2012. dscout. In *Ethnographic Praxis in Industry Conference Proceedings*, Vol. 2012. Wiley Online Library, 378–378.
- [56] Longqi Yang, David Holtz, Sonia Jaffe, Siddharth Suri, Shilpi Sinha, Jeffrey Weston, Connor Joyce, Neha Shah, Kevin Sherman, Brent Hecht, et al. 2022. The effects of remote work on collaboration among information workers. *Nature human behaviour* 6, 1 (2022), 43–54.

A APPENDIX

Table A1: List of survey questions on worker wellbeing and work engagement 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
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
Time flies	Time flies when I am working.	1 (never) to 7 (always)	Entry, Weekly, Exit
Resilience	At my job, I am very resilient, mentally.	1 (never) to 7 (always)	Entry, Exit
Perseverance	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

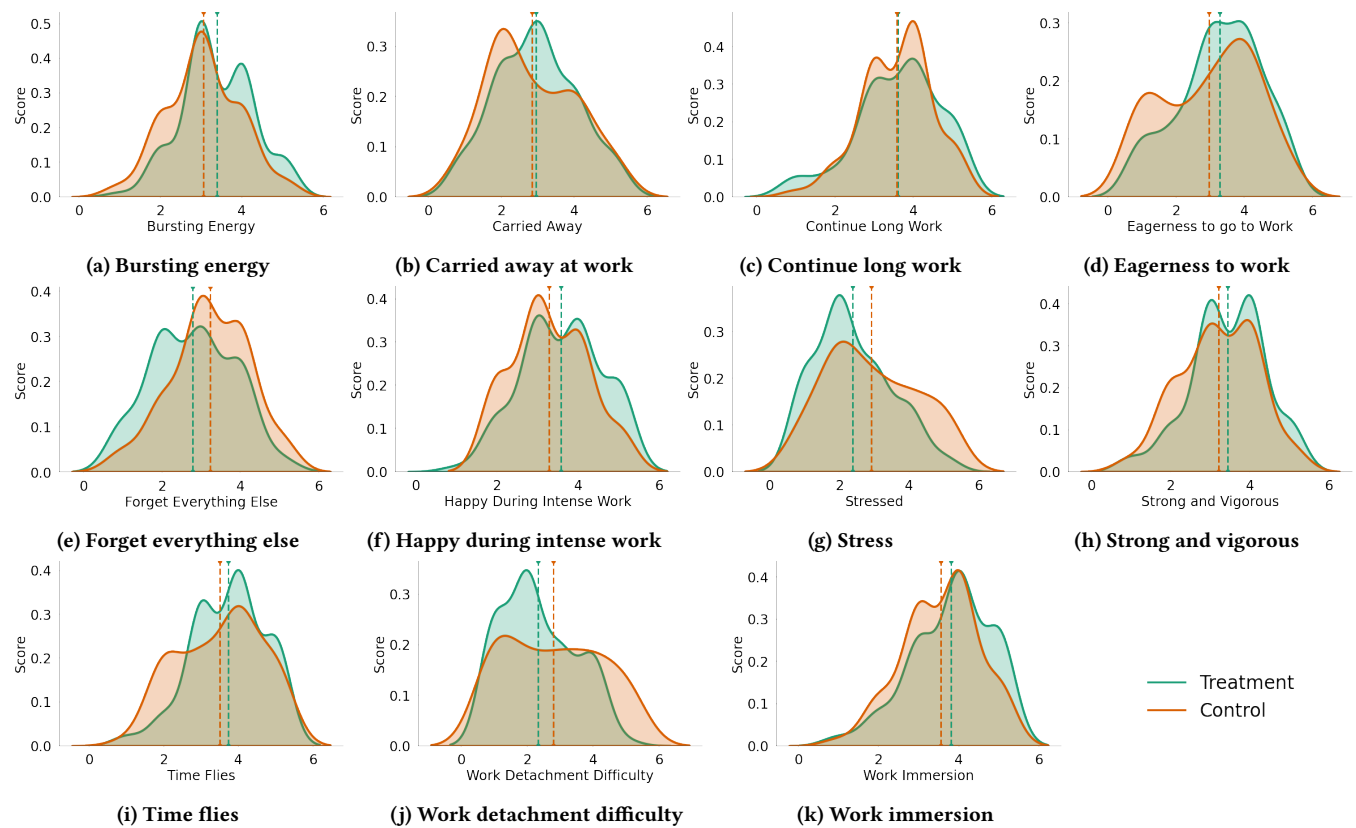


Figure A1: Comparison of Treatment and Control individuals' distribution of responses. Dotted lines represent the mean of the distribution of respective colors.