Zooming in from Home: A Mixed-Methods Diary Study Examining Multitasking in Virtual Meetings when Working from Home

Radhy Muhammad Ampera
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UCL Interaction Centre, University College London
Supervisor: Duncan Brumby

ABSTRACT

The COVID-19 pandemic has forced people to work from home while remaining connected through virtual meetings. Within these virtual meetings, individuals often multitask on other activities. However, there is still little research about how knowledge workers multitask in virtual meetings while working at home. To investigate this, 12 participants completed a survey measuring polychronicity and were asked to create diary entries after each virtual meeting throughout five workdays to measure multitasking and meeting features. Semi-structured interviews were conducted to complectement this diary data. The diaries showed that topic relevance correlated with multitasking behaviour in meetings. The interviews suggest that different meeting settings are used when multitasking. Furthermore, the interviews discovered five motivations to multitask in virtual meetings that vary in objectives. This dissertation closes by discussing the ways knowledge workers and virtual meetings can use these findings for better virtual meeting experiences.

Author Keywords

Multitasking; virtual meetings; working from home; diary study.

ACM Classification Keywords

H.5.m. *Information interfaces and presentation* (e.g., HCI): Miscellaneous.

MSc Contribution Type

Empirical.

1. INTRODUCTION

The COVID-19 pandemic has disrupted the way people work and study across the globe. As the number of infections increased, governments have closed borders and shut down physical workspaces. In April 2020, 95% of Americans were required to stay at home [12]. Responding to this, organizations have adapted their work arrangements to accommodate these new constraints, including working from home for large numbers of knowledge workers. In May 2020, 35.2% of the U.S. workforce was documented to be working from home [2]. This is stark change from the 2017 U.S Census which found only 5.2% of U.S. workforce working from home [8,28].

To remain connected and collaborative from home, knowledge workers have become increasingly reliant on virtual meeting services [7,25]. This is shown by the large increased use of virtual meeting services such as Microsoft Teams which gained 20 million users from November 2019 to March 2020 [40]. However, virtual meetings are not without its limitations. An exploratory study on Indonesian teachers who provided lessons through virtual meetings, reported finding it difficult to work from home during the pandemic and attributed these difficulties to the different atmosphere and distractions at home [42]. Moreover, workers often use the same device for working and accessing virtual meetings. This use of the same device often facilitates knowledge workers to multitask between participating in virtual meetings and simultaneously working on something else [35]. This exacerbates the distractions knowledge workers must manage while working from home.

For all the anecdotes and speculation about working from home during the pandemic, there is still little research about how knowledge workers have used virtual meetings while working from home. In particular, how have knowledge workers been multitasking in virtual meetings while working at home? What are the factors influencing multitasking in virtual meetings while working at home? What secondary tasks have employees performed when multitasking while working at home? What are the motivations behind multitasking in virtual meetings while working from home? These questions come at a time when coordination and productivity have never been more consequential. This dissertation provides an analysis of how multitasking occurred in virtual meetings while working from home. To

study this question, a mixed method study was conducted using surveys, diary methods and semi-structured interviews.

2. RELATED WORK

2.1. Definition of multitasking

Multitasking is often defined as the act of simultaneously performing two or more tasks within a certain period of time [10,15,23,32]. However, a review of previous studies indicate that a more commonly accepted definition of multitasking is the ability to quickly switch between two or more tasks [10,15,43]. The reason behind an individual's self-induced task switching can vary. Jin and Dabbish [21] conducted a qualitative study investigating self-interruption, and identified 7 types of self-interruption. These types were adjustment, break, inquiry, recollection, routine, trigger and wait.

To measure the amount of multitasking performed during a period of time König et al. [26] created a four item scale. The items contained the item stem "During a typical work hour...". This item stem was created to achieve a common frame of reference and to fit into people's temporal schemata [31]. Following this item stem, the items were "… I am occupied with several things simultaneously", "… I work on more than one task", "… I work on tasks in a sequential manner" (reverse coded), and "… I accomplish several tasks simultaneously". The scale was validated by correlating answers to three hypothetical multitasking situations and answers to the multitasking behaviour scale. The current study uses the multitasking behaviour scale from König et al. [26] with minor modifications to measure multitasking in virtual meetings.

2.2. Polychronicity

König and Waller [27] note that the term 'polychronicity' should only be used to describe an individual's preference for doing several things at once, whereas an individual's behaviour of doing several things at once, should be referred to as 'multitasking'. People with higher polychronic proclivities have a preference for multitasking, whereas people with lower polychronic proclivities have a preference for monotasking. It is worth noting that the time in which multiple tasks occur should be contextually-dependent and that a task should be defined as contextually-relevant unit of work containing thematically related activities [27]. In the current study, I define participating in a virtual meeting as a task.

Several scales exist to measure polychronicity. Bluedorn et al. [4] created a ten-item inventory of polychronic values (IPV), which has been used often to gauge preference towards multitasking behaviour. Poposki and Oswald [41] identify potential issues with the IPV, which is that it measures components irrelevant to polychronicity. In doing so, the IPV conflates the conceptual clarity between polychronicity, multitasking behaviour and cultural belief. To overcome some of the limitations of the IPV, Poposki and

Oswald developed the fourteen-item Multitasking Preference Inventory (MPI) [41]. In the current study, I use the Multitasking Preference Inventory to measure the polychronicity of participants.

2.3. Factors of multitasking

Multitasking has been investigated from different perspectives, within different contexts, with different scopes of tasks and different periods considered [9,22,33,37]. König et al. [26] studied multitasking in the context of work and found that multitasking determinents can be categorized into two types, namely personal determinents and situational determinents. Individual polychronicity was found to be the most important predictor of multitasking but the situational determinant of work demands was also found to be a predictor.

Previous studies have also investigated multitasking in face-to-face meetings. Kleinman [24] conducted a qualitative study and found that individual polychronicity had an effect on how people multitasked in face-to-face meetings. Additionally, Stephens and Davis [45] used a cross-organizational approach to explore the social influences of electronic multitasking. They found that organizational norms for multitasking in meetings and an individual's perception of others' thoughts concerning multitasking affected people's multitasking behaviour.

For a more contextualized investigation into multitasking in virtual meetings I look to Wasson's ethnographic study [46]. Wasson Identified several factors affecting multitasking in virtual meetings. First, interactional barriers in the form of different levels of visual and auditory access between participants determine the amount of multitasking performed. Second, meeting activity affected multitasking by determining the amount of attention required from employees. Information sharing was found to require the least amount of attention, then routine decision-making, then idea generation and problem solving required the most amount of attention. Third, topic relevance was found to be a trigger for employees to stop multitasking when a relevant topic arose in the meeting [30,46]. Fourth, employee's multitasking was shaped by the urgency of competing claims [46]. Lastly, personal multitasking skill found that employees had varying multitasking abilities and this reflected their multitasking in virtual meetings [46]. However, recent studies have suggested that the ability to multitask cannot be equated to actual multitasking behaviour, rather the ability to multitask is only an indication of fluid intelligence or other cognitive ability [4,19,38]. In the current study I use the factors proposed by Wasson [46] as the theoretical background to investigate multitasking within virtual meetings, with the modification of replacing personal multitasking skill with polychronicity as it has been found to be predictor of multitasking in work [26] and in face-to-face meetings [24].

One limitation of Wasson's research [46] is that the ethnographic study was limited to "teleconference plus

computer connection" and virtual meetings using videoconferencing were not examined. Since then, there have been vast developments in videoconferencing, and it is now widely used for virtual meetings. An attempt to bridge this gap was made by Brubaker et al. [5] who conducted a qualitative study into the behaviours and attitudes of video communication users, and found that video settings constrain physical behaviour, exaggerate displays of attention and makes multitasking less likely. However, this study interviewed employees working under normal conditions, and not a forced working from home condition. The current study aims to extend Wasson's study by investigating the factors affecting multitasking in virtual meetings with videoconferencing capabilities. Furthermore, the current study attempts to replicate the findings of Brukbaker et al. [5] but within the context of working from home.

2.4. Multitasking in virtual meetings

People multitask in virtual meetings for different reasons. Krishnan et al. [29] found that it can be due to a workplace culture that requires employees to work on multiple tasks or multiple projects at once. Whereas Kuzminykh and Rintel [30] found that employees multitasked in meetings as a strategy to get work done while also listening to meetings.

The secondary tasks performed while multitasking in virtual meetings can vary. Marlow et al. [35] classify these secondary tasks into three categories. The tasks can be related to the meetings itself; the tasks can be related to other work that is not related to the meeting, or the task can be entirely personal.

Marlow et al. [35] found that the perceived type of secondary task performed affected an observer's perception of an individual's multitasking in virtual meetings. The more observers of multitasking assumed that the activities of multitaskers were meeting-related, the more polite they rated the behaviour. Whereas when the activities of the multitasker were assumed to be personal, or related to other work, observers viewed the behaviour to be less polite.

However, the perception of multitasking is not always affected by the perceived secondary task performed. There are also times where multitasking in virtual meetings can be acceptable. Kuzminykh and Rintel [30] found that low engagement in a virtual meeting can be an established social practice, and that in certain conditions, some meetings expect less engagement than others. And as such companies have been working to overcome the stigma associated with the lower employee visibility in remote work [16].

2.5. Working from home

A review on previous studies found that there is a lack of consensus regarding the effects of working from home towards productivity. Bloom et al. [3] conducted an experiment comparing the productivity of call centre employees working from home and working in the office. The firm in which the experiment took place was initially concerned that employees would multitask on other activities only possible at home, such as watching TV or playing computer games. The experiment revealed that employers' concerns were misplaced as employees working from home did not multitask and experienced an increase in performance. On the contrary, Dutcher [14] found that routine jobs are less effectively performed at home. He conducted lab experiments on routine and nonroutine tasks with and without remote monitoring, and found routine tasks were negatively affected when mimicking a home environment. He attributed these effects to the lack of peer and manager effect which have been shown to be important in low-level tasks [1,17,36].

To better understand how meetings have occurred while employees worked from home, DeFilippis et al. [12] explored the impact of COVID-19 on employee's digital communication patterns in 16 large metropolitan areas in North America, Europe and the Middle East. They compared meeting and email meta-data before and after lockdowns and found that the number of meetings per person increased by 12.9%, however the time spent in meetings decreased by 11.5%. Furthermore, they found that the duration of the average workday increased by 8.2% or 48.5 minutes. The authors conjectured that the lengthened workday was caused by the heightened need for more communication.

2.6. Diary studies

Diary studies have the advantage of a high ecological value as they are carried out *in situ* [11,20]. Furthermore diary studies greatly reduce retrospection bias that is associated with traditional survey design, as the diary entries are temporally close to the experience [20]. However, a disadvantage is that diary studies can become tedious for participants and the process of creating diary entries can add to the interruption of the flow of daily events [11], additionally it can be difficult to ensure compliance and the accurate reporting of events [20]. Despite the disadvantages, I believed that the ecologically valid data could provide interesting insights of multitasking in virtual meetings, while acknowledging the flaws in comprehensiveness and accuracy.

Diary studies can have various types of designs, one type is the event-based design. Event-based designs ask participants to report a diary entry every time an event meets a preestablished criterion [20]. As such, a clear definition of the event in which must be provided to participants or these events may go unreported [20]. In the current study I use an event-based design as the study is concerned with the specific instance of multitasking in virtual meetings.

The data provided from a diary study can be analysed in several ways. First, descriptive statistics can be calculated by averaging the diary entries based on the context of interest [20]. These statistics can provide insights into the degree and volatility of responses throughout the period of the diary study. Second, more formal analyses of between and within person variation can be done using multilevel modelling [20,39]. Multilevel modelling is recommended to be used on

data with a minimum of 30 participants [34]. These models can be used to identify predictors given a set of diary study data. Furthermore, it considers the different numbers of diary entries for each person [20] and disentangles between and within person effects [39], such as those that exist when analysing virtual meeting experiences from different people. In the current study I focus on providing a descriptive overview using the data gathered, but later discuss how future studies could utilize multilevel modelling.

3. THE CURRENT STUDY

Previous research has examined the factors influencing multitasking in work [26], in face-to-face meetings [24,45], in virtual meetings without videoconferencing [46] and in video meetings within normal working conditions [5]. However, there is little research examining the factors affecting multitasking in virtual meetings with videoconferencing while working from home. How have employees been multitasking in virtual meetings while working at home? What are the factors influencing multitasking in virtual meetings while working at home? What secondary tasks have employees performed when multitasking while working at home?

The current study addresses these gaps through three stages. First, a survey to assess multitasking preference and individual measures. Second, a diary study to measure the amount of multitasking behaviour and meeting features in virtual meetings. Third, semi-structured interviews [47] to explore the factors affect multitasking in virtual meetings, the secondary tasks performed while multitasking and the motivations to multitasking in virtual meetings.

4. METHOD

4.1. Participants

A sample of 12 knowledge workers were recruited through opportunistic sampling. Participants were required to have at least two virtual meetings each day. Participants ranged in age from 18 to 44. Participants provided their age in ranges and not with a specific number. 3 (25%) participants were male, 9 (75%) were female. Participants were given a £15 Amazon voucher for participating in the weeklong study.

4.2. Design

The study used a mixed methods approach consisting of a survey to assess individual measures, event-based diary [20] where participants would fill out diary entries after every virtual meeting to collect multitasking behaviour and meeting features, and a follow up semi-structured interviews [47] to learn about secondary tasks and motivations to multitask. The survey was also used as a screener survey whereby only participants who scored certain MPI ranges continued onto the diary study. This selection of MPI ranges was done in order to gather data from a range of different MPI scores.

4.3. Survey

In the first stage, a survey was conducted to gather individual measures. The individual measures assess demographic and polychronic characteristics. Additionally, participants were asked about their workspace, virtual meeting experiences and work context.

4.3.1. Demographics

The survey began by asking participants about their demographics. The variables included gender, age, ethnicity and household composition.

4.3.2. Polychronicity

Polychronicity was measured with the fourteen-item MPI scale [41]. Sample items include, 'I would rather switch back and forth between several projects than concentrate my efforts on just one.' and 'I don't like it when I have to stop in the middle of a task to work on something else.' Ratings were made on a 7-point, Likert-type scale (strongly disagree to strongly agree). The ratings are then summed resulting in a total MPI score. The possible MPI score ranged from 14 to 98, with lower scores indicating less polychronic attitudes.

4.3.3. Virtual meeting experiences

Participants were asked about their virtual meeting experiences. The questions included, their average number of virtual meetings each week, where they have their virtual meetings, the equipment used for virtual meetings, and their satisfaction with their virtual meeting setup.

4.3.4. Work context

Work context was assessed by asking participants about their employment status, industry, rank and role.

4.4. Diary Entry Measures

4.4.1. Multitasking

Multitasking behaviour was measured with the four-item Multitasking Behaviour scale developed by König et al. [26], with a two minor modifications. First, the item stem was modified from 'During a typical work hour…' to 'During the virtual meeting…', so that it refers to the time context relevant to virtual meetings. This modification is pursuant to König and Waller's suggestion that the time in which multiple tasks occur should be contextually dependent [27]. Second, the item 'I worked on tasks in a sequential manner' (reverse coded) was changed into 'I was only occupied with the virtual meeting'. This adjustment was made as the initial item was designed to measure the amount of monotasking of tasks completed sequentially. Within the context of virtual meetings, the initial item cannot be used to measure monotasking as any sequential task completion would have to be done after or before the virtual meeting. Thus, the modified item solves this issue and measures monotasking by asking participants if they were only occupied with the virtual meeting. After the adjustment, the items were '… I was occupied with several things simultaneously', '… I worked on more than one task', 'I was only occupied with the virtual meeting' (reverse coded), and 'I accomplished several tasks simultaneously'. Ratings were made on a 7-point Likert scale (1 meaning strongly disagree to 7 meaning strongly agree). The possible multitasking score ranged from 7 to 28, with lower scores indicating less multitasking

behaviour and higher scores indicating more multitasking behaviour.

4.4.2. Meeting features
Meeting features were recorded using three variables inspired by Wasson's study [46]. The variables were interactional barriers, meeting activity, and topic relevance. First, interactional barriers were measured with closed-ended questions which included, 'Did you turn on your video?', 'Did other participants turn on their video?', and 'Did the meeting utilize collaboration software (e.g. miro)'. Next, meeting activity was measured with a single multiple-option question, 'What was the meeting activity?'. The possible answers were taken from Wasson's typology of virtual meeting activities [46] which are, 'Information sharing', 'Routine decision-making', 'Idea generation', and 'Problem solving'. Lastly, topic relevance was measured with a single 7-point Likert scale question, 'How relevant was the meeting topic to you?' (1 meaning Extremely irrelevant to 7 extremely relevant).

4.5. Interview
In the final stage of data collection, participants were invited to semi-structured interviews [47]. Participants were asked to reflect on their experiences on multitasking in virtual meetings, both throughout the diary study and in general. They were asked questions regarding how they multitasked, when they decided to multitask, why they multitask and what multitasking activities they performed.

4.6. Procedure
The study comprised of three stages of data collection. First, participants filled an online questionnaire. This questionnaire assessed the participants' demographics, polychronicity, virtual meeting context and work context. The survey also severed as a screener survey whereby only participants who scored certain MPI ranges were invited to the diary study. This selection of MPI ranges was done in order to gather data from a range of different MPI scores. Additionally, participants who were invited to the diary study were required to have at least two meetings each day. Next, participants were briefed on how to fill out the diary entries. The diary study lasted for 1 work week (5 days of data collection). The diary study had an event-based design, in which participants were asked to answer the questionnaire after every virtual meeting they had. Throughout the week participants were given reminders to complete their diary entries, and support was provided to participants who had questions about the diary study. After the completion of the diary study, participants were contacted for a 30-minute interview regarding their multitasking behaviours in virtual meetings.

5. RESULTS
Results are presented in two sections. First, the results of the survey are presented which provides insights about the demographics, polychronicity, virtual meeting context and work context of participants. Second, the results of the diary study and interviews are presented which provides quantitative and qualitative insights about polychronicity, topic relevance, meeting activity, virtual meeting settings and how these factors affect multitasking as well as the secondary tasks performed and motivations to multitask.

5.1. Survey

5.1.1. Demographics
The 12 participants included in the analysis ranged in age from 18 to 44. Participants provided their age in ranges and not with a specific number. 3 (25%) participants were male, 9 (75%) were female.

5.1.2. Polychronicity
Polychronicity was calculated by summing the coded answers to the MPI questionnaire, with items 4, 5, 6, 8, 10, 11, 13 and 14 reverse coded. The MPI score of the 12 participants ranged from 20 to 73 (*M MPI Score = 48.16, SD = 14.67*). Figure 1 shows the distribution of MPI scores.
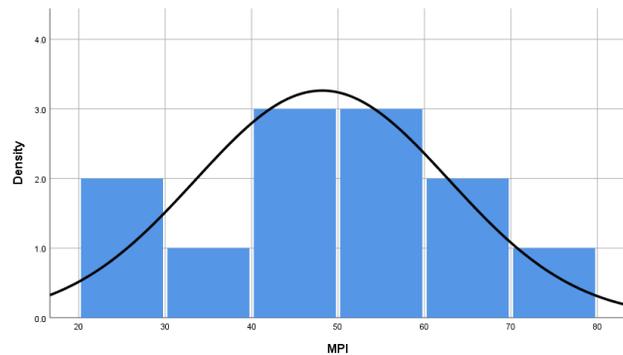

Figure 1. Distribution of MPI scores

5.1.3. Virtual meeting experiences
Participants had varying amounts of meetings each day, 4 participants had 1 daily meeting, 2 participants had 2 daily meetings, 1 participant had 3 daily meetings, 2 participants had 4 daily meetings, and 3 participants had more than 4 daily meetings. When asked about where participants had their virtual meetings, 9 (75%) participants had their meetings in a bedroom, 3 (25%) participants had their meetings in a space shared with others. No participants reported having their meetings in a dedicated home office.

5.1.4. Work context
Participants worked in various industries. 5 participants worked in technology, 3 participants worked in academia, 2 participants worked in finance, 1 participant worked in entertainment services, and 1 participant worked in strategy consulting. Within these industries participants had different roles. 4 participants were students, 3 participants were consultants, 1 participant was a trained professional, 1 participant was a researcher, 1 participant was in junior management, 1 participant was in middle management, and 1 participant was self-employed.

5.2. Diary study and interview
Participants created 124 diary entries in total. Of these, 2 entries used invalid participant IDs, and 1 entry was

incomplete leaving 121 valid diary entries. Mean entries per person was 10.08 (SD = 7.30). After the diary study each participant was interviewed. These interviews were transcribed and were analysed thematically using an inductive coding approach. In this section, I present the data from the diary study and direct quotations from the thematic analysis of the interview. I cluster this around three different headings, factors affecting multitasking, secondary tasks performed while multitasking, and motivations to multitask.

5.2.1. Factors affecting multitasking

First, I consider how people multitasked in their virtual meetings. Multitasking data from the diary entries was calculated by summing the coded answers to König's multitasking scale, with item 2 being reverse coded. The multitasking score of the 121 entries ranged from 4 to 28 (M = 16.41, SD = 7.54). As shown in Figure 2, participants tended to multitask in their virtual meetings.
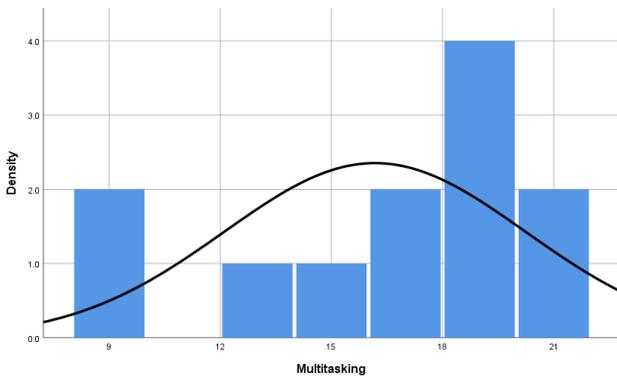

Figure 2. Distribution of multitasking

5.2.1.1. MPI

For the statistical analysis of MPI, data was aggregated on the individual participant level. Results of the Pearson correlation indicated that there was no correlation between MPI and multitasking, (r(10) = .01, p = .955). Figure 3 shows the relationship between MPI (M = 48.17, SD = 14.67) and multitasking (M = 16.34, SD = 7.55). As can be seen in Figure 3, there was no correlation between MPI and multitasking (i.e. the slope of the line of best fit is flat).
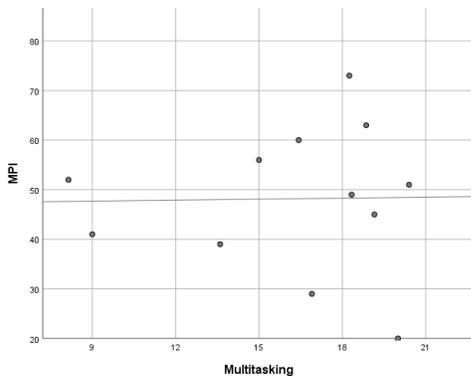

Figure 3. Association between MPI scores and multitasking behaviour

5.2.1.2. Interactional barriers

To understand the role of interactional barriers in multitasking I first look to the video settings used by participants during the diary study. Of the 121 entries, 45 (37%) meetings had the participant's video on and 76 (63%) meetings had the participant's video off. An independent samples t-test was computed to compare multitasking in video on and video off conditions. Figure 4 shows that there was not a statistically significant difference in multitasking behaviour for meetings with videos on (M = 17.42, SD = 6.56) and meetings with videos off (M = 15.82, SD = 8.04); t (119) = -1.13, p = .259. These results suggest that video settings do not have an effect on multitasking behaviour in virtual meetings.
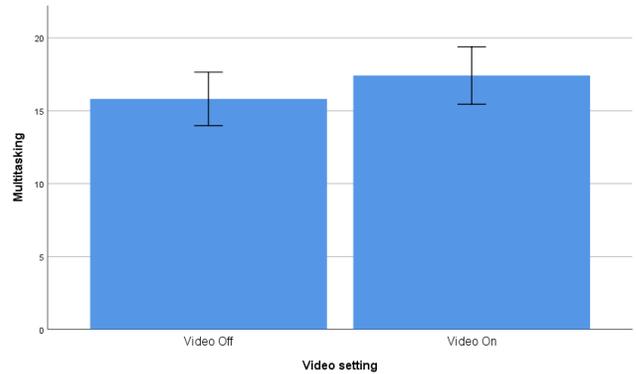

Figure 4. Effect of video settings on multitasking

However, the interview data suggests the contrary. Participants described turning their video off in order to multitask, as explained by participant 12.

P12: I try to avoid video just so I can multitask.

This was elaborated by participant 10 who explained that they would not want to be rude by not looking at the person during a video call.

Interviewer: Why don't you multitask with your video on?

P10: I think it's rude if you don't look at the person that you are having a conversation with. If you are having it in a video call that is.

Next, I present the microphone settings of participants during the diary study. Of the 121 entries, 55 (45%) meetings had the participant's microphone on and 66 (54%) meetings had the participant's microphone off. An independent samples t-test was computed to compare multitasking behaviour in microphone on and microphone off conditions. Figure 5 shows that there was not a significant difference in multitasking behaviour for meetings with microphone on (M = 17.35, SD = 7.50) and meetings with microphone off (M = 15.64, SD = 7.54); t (119) = 1.24, p = .216. These results suggest that microphone settings do not have an effect on multitasking behaviour in virtual meetings.
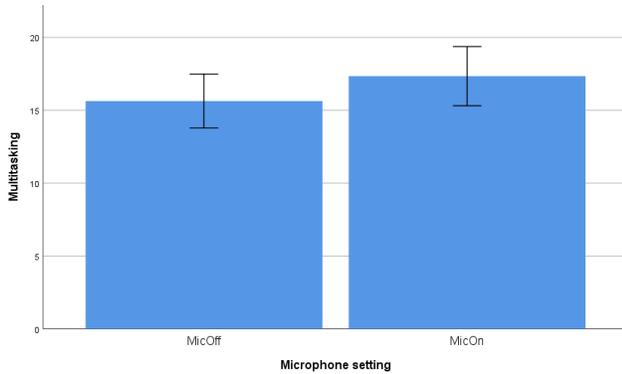
Figure 5. Effects of microphone settings on multitasking

Similar to video settings, in the interviews some participants explained that they would turn off their microphone when multitasking, as explained by participant 11.

P11: Generally, when I'm not doing things that are related [to the meeting] I turn it [the video and microphone] off.

However, participants also said that they turned off their microphone because it was their default setting when not talking and to mute background noise, as explained by participant 3.

P3: I always turn off my camera and my mic but if I need to answer then I will turn it on. [...] if I turn on my mic for the whole duration of the meeting, sometimes the sounds from the environment can become a distraction for the meeting.

5.2.1.3. Meeting activity

Data from the diary entries was analysed using a one-way between subjects ANOVA to compare the effect of meeting activity on multitasking behaviour in information sharing, routine-decision making, idea generation and problem solving conditions. As can be seen in Figure 5 there was not a statistically significant effect of meeting activity on multitasking behaviour for the four conditions [$F(3,220) = 1.95$, $p = .121$]. This suggests that meeting activity does not have an effect on multitasking.
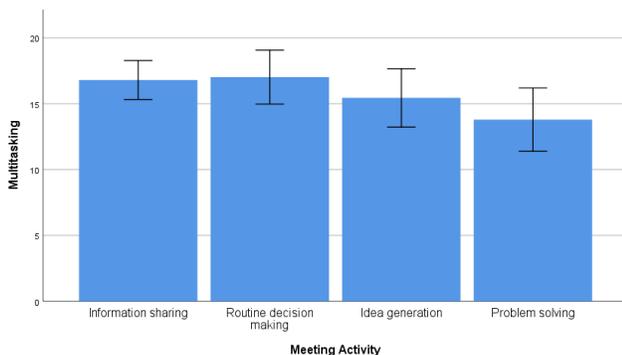

Figure 4. Effect of meeting activity on multitasking

However, the interviews tell a different story. Participants reported how they would likely multitask if the meeting activity was information sharing. Participant 1 explains that they used the number of participants in a meeting as an indicator of the meeting activity and if they need to focus or not.

P1: If there's 20-30 people. My assumption is that it's more likely to be knowledge sharing, a kind of town hall meeting where people are talking about what they're up to you, and therefore You don't need to be as engaged or switched on it.

5.2.1.4. Topic relevance

The statistical analysis for topic relevance was done at the diary entry level. Results of the Pearson correlation indicated that there was a moderate correlation between topic relevance and multitasking ($r (119) = -.374$, $p < .001$). Figure 6 shows the relationship between topic relevance ($M = 6.12$, $SD = 1.19$) and multitasking ($M = 16.34$, $SD = 7.55$). As can be seen in Figure 4, there was a moderate correlation between topic relevance and multitasking.
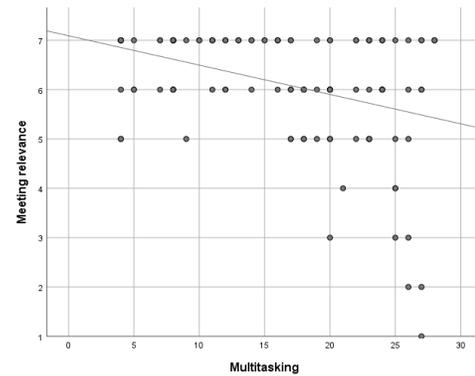

Figure 6. Association between topic relevance and multitasking

The interview data supports the findings of the diary study. Participants consistently reported they would be monitoring the meeting while working on other things if the meeting was not relevant, otherwise they would focus on the meeting, as explained by participant 11 and participant 1.

P11: If it's relevant and I really need that information then I'll really be focused. But if it's just somebody sharing then I could just listen I don't need to really be there. I could do other things while someone else is talking.

P1: I'll be keeping an eye out to see if my name is mentioned but otherwise, I'll be doing my work.

5.3. Secondary tasks while multitasking

Next, I consider what secondary tasks participants performed. As shown in figure 7, 87 entries had meeting related secondary tasks, 55 entries had work related secondary tasks, 36 entries had personal activity tasks and 15 entries were reported to have no secondary task.
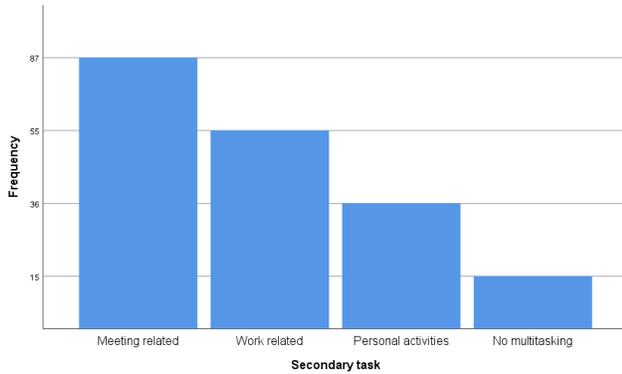
Figure 7. Distribution of secondary tasks

During the interviews participants emphasized the new secondary tasks they were able to perform due to working from home. For example, participant 8 was able to view their notes while presenting, this was a task that was not possible during in person meetings.

P8: Because I'm not a very good public speaker, I would have notes written down so I'll have notes out during the presentation, and then I'll be reading from my notes, [...] which is quite convenient because you can't do this in person.

An example of personal activities was provided by participant 6, a graduate student who reported that having the meetings from home enabled them to do housework such as cooking and laundry while listing to other meeting attendees.

Interviewer: What do you do when you're multitasking?

P6: Sometimes I make tea while I'm in these meetings. I walk around while I'm in these meetings, put things in the laundry. If it's a one-way meeting, sometimes I even cook while I'm at it.

Another example of personal activities was provided by participant 12, a consultant, who explain that they would exercise in meetings in which they didn't need to contribute to.

P12: I just exercise while I'm on a call. If I don't have to contribute. That's like a completely new way of multitasking, which I didn't do before.

5.4. Motivations to multitask

During the interviews participants were asked why they multitasked, they reported five different main reasons, *getting work done, efficiency, boredom, compensating* and *losing focus*. First, *getting work done*, participants consistently reported that the increased number of meetings left them with no time to get their work done. Therefore, to be able to do their work they multitasked between participating in virtual meetings and doing their work, as explained by participant 3.

P3: I have so many meetings during the day that I have no time to really get my job done. So yeah, I would say that the multitasking in the meeting is just me trying to

get my work done. Even if it's just a little. While still in the meeting and still getting information in the meeting.

A second reason was *efficiency*. Participants reported that they multitasked to make the most out of their time. Participant 12 explained how virtual meetings enabled her to make the most out of an otherwise lost hour.

P12: When you're in a face to face meeting, you cannot do anything but that meeting so if the meeting is irrelevant to you, you're kind of stuck. You've lost an hour. This way I get to make the most of my time.

Another reason was *boredom*. Participants had different views on multitasking due to boredom. Some multitasked as consequence of feeling bored, as explained by participant 6.

P6: I multitask when I'm bored so like I play with my phone when I'm bored so that's what I'm totally tuned out.

While other participants multitasked to avoid feeling bored in order to remain focused on the meeting, as explained by participant 10.

P10: I multitask to focus at what the other end is saying because otherwise, personally, I will get bored. Having to stay focused for 45 minutes, it's just too long for Me.

A fourth reason was *compensating*. Participant 2 explained that they hoped their multitasking would mitigate any negative perceptions other people had about them.

P2: If I'm quick to react to things like if the client says let's have a meeting, and then like a minute later. He's got an invite in his inbox. I'm hoping that that sort of behaviour where I'm like really quick to pick things up and react. Will mitigate what they might have noticed about me being be very quiet in meetings

Lastly, *losing focus*. Participants consistently reported that their multitasking was a consequence of them losing focus on the virtual meeting. However, they reported different causes for their loss of focus. Some participants thought they lost focus because of the duration of their virtual meetings, as explained by participant 7.

P7: I think it's because, those meetings like those seminars are for so long and I just lose focus. So, I think it's better for me like to do other things that interest me more at that time.

Whereas other participants found it difficult to focus on a screen throughout the entire workday, as explained by participant 11.

P11: We do lots of online meetings where we only face screens. It's so hard to concentrate only on a screen from 9 to 5.

6. DISCUSSION

The current study explored how people multitasked in virtual meetings while working from home. The diary study found

that multitasking behaviour in virtual meetings had a correlation with topic relevance, but not polychronicity, interactional barriers, or meeting activity. In line with this, the interviews also found topic relevance to affect multitasking. However, the interview findings differ from the diary study on interactional barriers and topic relevance and found that the respective meeting features influenced multitasking. The diary study showed that most secondary tasks performed while multitasking was meeting related, then work related and secondary tasks related to personal activities were performed least. Finally, the interviews discovered five different reasons people multitasked in virtual meetings.

Factors influencing multitasking in virtual meetings
The first research question in this study examined the factors influencing multitasking in virtual meetings while working at home. Kleinman [24] stated that polychronicity affected multitasking in face-to-face meetings because a worker's polychronicity would influence how accomplished they felt during face-to-face meetings, therefore motivating a worker to accomplish more tasks. This differs from the findings of the current study. The diary study found no correlation between an individual's polychronicity and their multitasking behaviour in virtual meetings. However, with the data from the current study we cannot speculate further as to why polychronicity does not affect multitasking in virtual meetings, but it would be an interesting focus of future research.

Meeting features have been found to affect multitasking. Wasson [46] claimed that interactional barriers, topic relevance, and meeting activity affected multitasking in virtual meetings. I discuss each meeting feature in turn.

First, interactional barriers. The diary findings of the current study differ from previous research. Neither video nor microphone settings were found to have a significant difference on multitasking behaviour. However, the interviews tell a different story. Participants reported preferring to multitask when their video and microphone was off. To help understand why people prefer to keep their video and microphone off when multitasking I draw on the work of Brubaker et al. [5] who argued that the turning on video in meetings constrains multitasking behaviour as it makes inattention highly visible. In the current study, the discrepancy between the findings of the diary study and interviews could be due to the different sample sizes between the different interactional barrier conditions, therefore making it not possible to conduct a paired t test on the data.

Second, topic relevance. In the current study, both the findings of the diary study and the interviews are in line with previous research. The diary study found that topic relevance had a moderate correlation with multitasking behaviour. During the interviews, participants reported that they tended to multitask when they felt that they were not needed, when they already knew the information, or when they did not have to speak in the meeting. These findings are in line with previous research [30,46] which found that people multitasked in meetings that they felt were not essential but were in those meetings as they did not want to be seen as absent.

Third, meeting activity. In the current study, the findings from both the diary study and the interviews differ from previous research. The diary study found no significant effect on multitasking behaviour in all four of the different meeting activity types. Whereas in the interviews, participants reported they would not multitask in meetings where they were giving or receiving new relevant information. These interview findings contradict Wasson's study [46], which argues that of all the meeting activity types, information sharing required the least attention and therefore was the meeting activity in which multitasking was most likely to occur in. A possible explanation for the discrepancy between the interviews and Wasson's study [46] is that the information referred to in the interviews were relevant, therefore making the meeting topic relevant thus minimizing the amount of multitasking as explained previously.

Secondary tasks performed while in virtual meetings
Employers are often concerned that employees working from home will multitask in activities usually prohibited in the office [3]. Contrary to many employers' concerns, the current study found that the majority of secondary tasks performed while multitasking was meeting related and work related. Furthermore, the interviews found that working from home enhanced a worker's productivity in a meeting as they were able to multitask in meeting related activities that they could not do in the office, such as reading notes while presenting. The findings from the interview differ from Dutcher's [14] study which found that routine jobs are less effectively performed at home due to a lack of monitoring [1,17,36]. This difference could due to the lack of monitoring which enabled the participant in the current study to multitask in meeting enhancing activities.

Of the three types of multitasking activities: meeting related, work related, and personal activities. The current study found personal activities to be the least performed. When workers did multitask on personal activities, working from home enabled them to do activities that were not possible when working from the office, such as cooking, laundry and exercise.

Motivations to multitask
When participants were asked why they switched between virtual meetings and secondary tasks, they reported five different main reasons, *getting work done, efficiency, boredom, compensating* and *losing focus*. The first reason, *getting work done* was because participants found themselves having too many meetings and not enough time to do work. This is supported by the study by DeFilippis et al. [12] which found there was an increase in the number of meetings since employees worked from home due to COVID-19. Additionally, Dockery and Bawa [13] explained

that employees working from tend to work longer hours as they are required to attend to both work responsibilities and non-work responsibilities, further exacerbating the worker's lack of time. Furthermore, this is in line with Wasson's factor of competing claims [46] which states multitasking is shaped by the urgency of other needs which in this context of working from home would be the need to get work done.

Next, to better understand the reasons of *efficiency* and *boredom* I draw on work of Jin and Dabbish [21] which investigated the reasons individuals choose to switch tasks, they identified 7 types of self-interruption: adjustment, break, inquiry, recollection, routine, trigger and wait. The self-interruption type "wait" is defined as performing a different task to fill time due to being temporary unable to continue the primary task [21]. This is similar to *Efficiency* which was defined by participants wanting to make the most of their time by performing tasks while waiting for a relevant topic in the meeting. A benefit of working on other tasks while waiting to contribute to the meeting is that participants are able to maximize productivity [21].

With regards to *boredom*, participants defined this as either performing secondary tasks due to being bored and performing secondary to avoid being bored in order to stay focused. The former definition is similar to self-interruption type "break" whereby an individual switches to a more desirable task because of frustration or fatigue with the primary task [21]. A benefit of a break is that it can improve an individual's mood [21]. Whereas the latter definition is similar to the self-interruption type "adjustment" whereby an individual improves the productivity of the primary task by performing a secondary task [21]. However workers should also be cautious when taking breaks and performing adjustments as they can lead to the abandonment of the primary task [21], which in the context of virtual meeting may result in workers being completely disengaged from the meeting.

Compensating was defined as participants performing meeting related secondary tasks in order to mitigate negative perceptions from other participants in the meeting. This is in line with Marlow et al. [35] who found that when the activities of the multitasker were related to the meeting, then observers would perceive the multitasking positively. Additionally this could be an example of a meeting that expects less engagement as stated by Kuzminykh and Rintel [30].

Lastly, participants reported *losing focus* as a reason behind their multitasking. In one instance they reported their loss of focus due to difficulties on concentrating on a screen for the entire duration of the workday. This could be explained by Dockery and Bawa [13] who state that working from home can lead to a lower motivation to work, especially for personality types who depend on interaction and positive feedback from others. Individuals with these personality types who wish to remain focused and motivated to work

could be advised to actively seek for interaction and positive feedback while working from home.

Implications for workers
The findings show that multitasking is influenced by topic relevance. However, topic relevance is not always known by all participants of a meeting. Therefore, if a worker would like the other participant's complete attention then it may be necessary to check the relevance of the topic discussed.

Implications for virtual meeting systems
The interviews found that people turned on their videos and microphones when engaging in the meetings but turned off their videos and microphones when multitasking. Virtual meeting systems could use this behaviour to indicate the attention of attendees in a meeting. Additionally, virtual meeting systems could add a feature in which users can set themselves different attention levels such as "Monitoring" or "Engaged". This would enable other meeting attendees to gauge the attention of others. Furthermore, this would avoid situations where important information is provided by a speaker but missed by an attendee who was focused on other tasks as the speaker could verify the attendee's attention prior to speaking.

Limitations
This study has several limitations. First, competing claims was not measured in the diary study. Perhaps by measuring the work demands of participants, a more comprehensive understanding of competing claims would have been achieved. Second, this was a mixed methods study with 12 participants with an incomplete range of different MPI scores. It is possible that with more data points and a complete range of different MPI score, there could be a relationship between polychronicity and multitasking in virtual meetings, as previously found in the context of work [26] and face-to-face meetings [24]. Third, as the study only had 12 participants, it was not possible to analyse the diary entries using multilevel modelling which requires a minimum of 30 participants [34]. Future studies with a minimum of 30 participants could use multilevel modelling to disentangle between and within person effects [39], such as those that exist when analysing virtual meeting experiences from different people. Lastly, the sample of participants worked in technology, academia, finance, entertainment services, and strategy consulting. Although this is already a variety of different industries, the insights in this study could be industry specific. Future research can extend this work with workers in other industries.

7. CONCLUSION
The aim of this study was to investigate how knowledge workers have multitasked in virtual meetings while working from home. The results showed that out of the four multitasking factors: MPI, topic relevance, meeting activity, and interactional barriers, only topic relevance was found to affect multitasking in the diary study and in the interviews. A closer look at the data showed that most secondary tasks performed while multitasking was meeting related, then

work related and personal activities were performed the least. The interviews suggested that multitasking was motivated by various reasons such as a desire to maximize productivity due to work demands or efficient use of time, to minimize the other meeting attendee's negative perceptions of the multitasker and a reaction towards unengaging virtual meetings. Hence, this study offered implications for workers and virtual meeting systems aimed at communicating the different attention levels of meeting attendees. I hope that this dissertation can stimulate a renewed focus on multitasking in the context of virtual meetings while working from home.

Acknowledgements

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DIVISION OF PSYCHOLOGY AND LANGUAGE SCIENCES

Participant Information Sheet For Healthy Adults in Research Studies

UCL Research Ethics Committee Approval ID Number: UCLIC/1819/007/Staff BrumbyMarquardtWong
Data Protection Registration Number: **Z6364106/2019/03/78**

YOU WILL BE GIVEN A COPY OF THIS INFORMATION SHEET

Title of Study: Diary study of multitasking during virtual meetings
Department: UCL Interaction Centre
Name and Contact Details of the Researcher: Radhy Ampera, radhy.ampera.19@ucl.ac.uk
Name and Contact Details of the Principal Researcher: Duncan Brumby, d.brumby@ucl.ac.uk
Name and Contact Details of the UCL Data Protection Officer: Lee Shailer, data-protection@ucl.ac.uk
This study has been approved by the UCL Research Ethics Committee
Project ID number: UCLIC/1819/007/Staff BrumbyMarquardtWong
Data Protection Registration Number: Z6364106/2019/03/78

1. **Invitation Paragraph**
   You are being invited to take part in a research project conducted as part of a MSc project at the UCL Interaction Centre. The purpose of the study is to understand how people multitask during virtual meetings. Participation is voluntary, but before you decide it is important for you to understand why the research us being done and what participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

2. **What is the project's purpose?**
   The aim of this project is to understand people's multitasking behaviours during virtual meetings. We would like to understand what factors influence people's multitasking during virtual meetings. This will be done by asking participants to complete a survey measuring their multitasking preference, a diary study logging their multitasking behaviours and meeting features, and a follow up interview to understand how participants multitasked during virtual meetings. We hope the findings from this study will create a better understanding of multitasking during virtual meetings.

3. **Why have I been chosen?**
   In order to participate you must be over 18, be in good health and participate in virtual meetings at least twice a week.

4. **Do I have to take part?**
   It is up to you to decide whether or not to take part. If you do decide to take part you will be asked to sign a consent form, if you wish, this information sheet can be sent to you via email (please email the researcher). You can withdraw at any time without giving a reason and without it affecting any benefits that you are entitled to. If you decide to withdraw you will be asked what you wish to happen to the data you have provided up that point.

5. **What will happen to me if I take part?**
   Taking part in this study will involve taking an online survey which will take approximately 10-20 minutes. It is a short survey about your workspace context, work context and virtual meeting experiences.

   After this online survey, some participants will be invited to participate in an online diary study and interview. If you are invited, you will be required to keep track of and record your multitasking activities during virtual meetings for one week. After this you will be invited to an interview by a researcher to discuss your experiences of multitasking in virtual meetings. This interview will be done through digital platforms (e.g. phone call or Skype call), and will last for approximately 30-60 minutes. You will be asked to describe your experiences and views relating to multitasking during virtual meetings.

   You may withdraw your participation at any time during this study if you wish. You might also be contacted to participate again in future research. Please provide your permission to be contacted again in the consent form.

6. **Will I be recorded and how will the recorded media be used?**
   Audio recordings will be made during the interview will be used for analysis. Recordings will be destroyed after the researcher has submitted and passed his MSc project. No one outside UCL Interaction Centre will be allowed access to the original recordings. However, they will be able to access anonymized and/or pseudonymized data.

7. **What are the possible disadvantages and risks of taking part?**
   There are no foreseeable discomforts, disadvantages and risks for taking part. However, if you do feel uncomfortable, please feel free to withdraw from the study at any time.

8. **What are the possible benefits of taking part?**
   The information you provide us with will potentially contribute to understanding how people multitask during virtual meetings.

   After completing the online survey your eligibility for the diary study will be assessed. If you are eligible, you will be invited to participate in the diary study where you will be compensated with a £15 Amazon voucher on completion of the diary study and follow up interview.

9. **What if something goes wrong?**
   If you wish to make a complaint regarding your treatment by the researcher who is conducting this study, please contact Duncan Brumby (d.brumby@ucl.ac.uk).

   Should you feel that your complaint has not been handled satisfactorily please contact the Chair of the UCL Research Ethics Committee (ethics@ucl.ac.uk).

10. **Will my taking part in this project be kept confidential?**
    All the information that we collect about you during the course of the research will be kept strictly confidential. You will not be able to be identified in any ensuing reports or publications.

11. **Limits to confidentiality**
    Confidentiality will be respected subject to legal constraints and professional guidelines.

12. **What will happen to the results of the research project?**
    The results of this work will be disseminated through published research articles. Pseudonymised quotes from the transcripts will be used and reported. All the information that we collect about you during the course of the research will be kept strictly confidential. You will not be able to be identified in any ensuing reports or publications.

13. **Local Data Protection Privacy Notice**
   The data controller for this project will be University College London (UCL). The UCL Data Protection Office provides oversight of UCL activities involving the processing of personal data, and can be contacted at data-protection@ucl.ac.uk. UCL's Data Protection Officer can also be contacted at data-protection@ucl.ac.uk**.**

   Further information on how UCL uses participant information can be found here: www.ucl.ac.uk/legal-services/privacy/participants-health-and-care-research-privacy-notice

   The information that is required to be provided to participants under data protection legislation (GDPR and DPA 2018) is provided across both the 'local' and 'general' privacy notices.

   The categories of personal data used will be as follows:

   - Name
   - Address
   - Age
   - Gender
   - Nationality
   - Occupation
   - Education Level
   - Email address
   - Phone number

   The lawful basis that would be used to process your *personal data* will be 'performance of a task in the public interest'.

   Your personal data will be processed for the purposes outlined in this notice. The legal basis that would be used to process your personal data will be the provision of your consent. You can provide your consent for the use of your personal data in this project by completing the consent form that has been provided to you.

   Your personal data will be processed as long as it is required for the research project.

   If we are able to anonymise or pseudonymise the personal data you provide we will undertake this, and will endeavour to minimise the processing of personal data wherever possible.
   If you are concerned about how your personal data is being processed, please contact UCL in the first instance at data-protection@ucl.ac.uk. If you remain unsatisfied, you may wish to contact the Information Commissioner's Office (ICO). Contact details, and details of data subject rights, are available on the ICO website at: https://ico.org.uk/for-organisations/data-protection-reform/overview-of-the-gdpr/individuals-rights/

14. **Contact for further information**
   Dr Duncan Brumby
   UCLIC, University College London, London WC1E 6BT, United Kingdom
   d.brumby@ucl.ac.uk

Thank you for reading this information sheet and for considering to take part in this research study.

CONSENT FORM FOR HEALTHY ADULTS IN RESEARCH STUDIES

Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.

Title of Study: Diary study of multitasking during virtual meetings
Department: UCL Interaction Centre
Name and Contact Details of the Researcher: Radhy Ampera, radhy.ampera.19@ucl.ac.uk
Name and Contact Details of the Principal Researcher: Duncan Brumby, d.brumby@ucl.ac.uk
Name and Contact Details of the UCL Data Protection Officer: Lee Shailer, data-protection@ucl.ac.uk
This study has been approved by the UCL Research Ethics Committee:
Project ID number: UCLIC/1819/007/Staff BrumbyMarquardtWong
Data Protection Registration Number: Z6364106/2019/03/78

Thank you for considering taking part in this research. The person organising the research must explain the project to you before you agree to take part. If you have any questions arising from the Information Sheet or explanation already given to you, please ask the researcher before you decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

I confirm that I understand that by ticking/initialling each box below I am consenting to this element of the study. I understand that it will be assumed that unticked/initialled boxes means that I DO NOT consent to that part of the study. I understand that by not giving consent for any one element that I may be deemed ineligible for the study.

			Tick Box
	1.	*I confirm that I have read and understood the Information Sheet for the above study. I have had an opportunity to consider the information and what will be expected of me. I have also had the opportunity to ask questions which have been answered to my satisfaction.	
	2.	*I consent to participate in the study. I understand that my personal information will be used for the purposes explained to me. I understand that according to data protection legislation, 'public task' will be the lawful basis for processing.	
	3.	**Use of the information for this project only** *I understand that all personal information will remain confidential and that all efforts will be made to ensure I cannot be identified. I understand that my data gathered in this study will be stored anonymously and securely. I understand that if the researchers are able to anonymise and psuedonymise the personal data you provide, they will do so. It will not be possible to identify me in any publications.	
	4.	*I understand that my information may be subject to review by responsible individuals from the University for monitoring and audit purposes.	
	5.	I understand the potential risks of participating and the support that will be available to me should I become distressed during the course of the research.	
	6.	I understand the direct/indirect benefits of participating.	
	7.	I understand that the data will not be made available to any commercial organisations but is solely the responsibility of the researcher(s) undertaking this study.	
	8.	I understand that I will not benefit financially from this study or from any possible outcome it may result in in the future.	
	9.	I understand that I will be compensated for the portion of time spent in the study or fully compensated for the part of the study I register for if I choose to withdraw.	

10.	I agree that my anonymised research data in this study may be used by the researchers in UCL Interaction Centre for future research. [No one will be able to identify you when this data is shared.]	
11.	I understand that the information I have submitted will be published as a report and I wish to receive a copy of it. Yes/No	
12.	I consent to my interview being audio/video recorded and understand that the recordings will be destroyed after the researcher has submitted and passed his MSc project.	
13.	I hereby confirm that: (a) I understand the inclusion and exclusion criteria as detailed in the Information Sheet and explained to me by the researcher; and (b) I do not fall under the exclusion criteria.	
14.	I am aware of who I should contact if I wish to lodge a complaint.	
15.	Use of information for this project and beyond I would be happy for the data I provide to be archived at the UCL Interaction Centre. I understand that other authenticated researchers and researchers in UCL Interaction Centre will have access to my anonymised and/or pseudonymised data.	

If you would like your contact details to be retained so that you can be contacted in the future by UCL researchers who would like to invite you to participate in future studies of a similar nature, please tick the appropriate box below.

	Yes, I would be happy to be contacted via email_____or phone number_____.	
	No, I would not like to be contacted	

Name of participant   Date   Signature

Researcher   Date   Signature

APPENDIX 2: INTERVIEW GUIDE

<u>Multitasking in virtual meetings</u>

During your virtual meetings do you find yourself multitasking?

How do you multitask?

Why do you multitask?

Is there an effect when multitasking?

       Is there a benefit?

       Is there a cost?

What do you do when you're multitasking?

       Can you provide an example of a task you do when multitasking?

<u>Factors of multitasking</u>

When do you find yourself multitasking?

       How does topic relevance affect your multitasking?

       How do your work demands affect your multitasking?

       How do different meeting activities affect your multitasking?

What settings do you use when multitasking?

       How do different video settings affect your multitasking?

       How do different microphone settings affect your multitasking?

<u>Working from home</u>

How has working from home changed the way you participate in virtual meetings?

How were virtual meetings before working from home?

How has working from home affected the way you multitask in virtual meetings?

How has working from home changed the secondary tasks you do while multitasking?