**Does feedback on interruption length influence people’s self-interruption behaviour?**

**Summary of findings so far**

Observations in Study 2 showed that data workers prepare paper information they need for a data entry task beforehand. Digital data items are retrieved as the task goes along. Reasons that influenced this behaviour were participants’ awareness of needing information beforehand, the affordances of paper versus digital to collect and group documents, and how long they expected it to take to access the information. For paper, it is clear to see the physical distance and thus time involved in retrieving a source. For digital information, the expected retrieval time is much less transparent. As soon as data workers realise they need digital information, they interrupt themselves and this can happen frequently during a single task. Finding information can take longer than expected, and people can get distracted along the way. In general, finding information is disruptive: people may have forgotten where they were in the task, enter information in the wrong fields or they might be automatically logged out of a system because of inactivity. It is therefore important that interruptions are scheduled at least disruptive moments in the task. Study 4 and 5 showed that in a controlled setting where people know there is a time delay in accessing an information source, they adapt and schedule their tasks accordingly. They will look up and enter items that take the least time first, and postpone getting information that takes more time to look up. In contrast, if there were no delays, participants looked up and entered information in the order in which it was presented in the data entry form. An issue is that people often do not know how long it will take them to get information and therefore cannot schedule or adapt to it. Can people be nudged into making interruptions that are less disruptive in terms of timing and duration, if they are given feedback on how long it takes them to find information?

**Introduction**

Studies have consistently shown that interruptions are disruptive to task performance. Interruptions lead to an increase in errors and increase task performance time (e.g. Trafton, Altmann, & Ratwani, 2011). However, sometimes an interruption can be relevant and even necessary for a task to be completed. For example, people may have to look up task-related information. Study 2 showed that even though data workers collected some information carefully before starting a task, they often interrupted their task to retrieve additional information. They either did not realise they needed this information until starting the task, or they perceived the information to be quick to find, and therefore did not feel the need to collect it beforehand. Other observational studies found that looking up task-related information was a common reason for self-interruptions, and was perceived by participants as part of the activity (Cangiano & Hollan, 2009; Jin & Dabbish, 2009).

A number of laboratory studies have looked at how people decide when to address interruptions. These studies showed that people defer interruptions until lower workload moments (Salvucci & Bogunovich, 2010), or switch to another task when there is a delay in the primary task (Gould, Cox, Brumby, & Wickersham, 2016; Katidioti & Taatgen, 2013). However, these studies primarily focused on characteristics of the primary task, and it is unclear from these studies if the time taken to address an interruption has any effect. Study 4 and 5 showed that if the time to access data items for a data entry task is consistent throughout a controlled experiment, participants learn to look up and enter easy-to-access items first, before looking up other items. Might people therefore manage their interruptions differently, if they are given feedback on how long it takes them to find information?

Gould, Cox, & Brumby (2016) looked at people’s switches to other, unrelated activities during an online routine data entry task. They found that a cue that asked participants to remain focused on the task after they had switched reduced self-interruptions. The two studies proposed in the current chapter aim to see if a cue after they have switched, which indicates the duration of the interruption, has any effect on the timing and duration of people’s subsequent switches to a related activity: look up information for a data entry task. Specifically, if people learn the length of their switches, will they try to reduce the length of future interruptions, and postpone ones that take longer to resume later in the task? The first study uses an experimental data entry task to measure if the cue has an effect on number, duration and timing of switches. It also aims to see if feedback on interruption duration makes people more accurate in estimating the time of subsequent interruptions. The second study replicates this study with data workers doing expenses work, to evaluate if the cue is suitable for an applied task, and to see whether the cue also has an effect on switches to other, unrelated activities.

**Study 1 – (lab/online?) experiment**

In the first study, an experimental data entry task will be used. The data entry task is similar to the task used in Study 4 and 5 and is conducted in a web browser (see Figure 1). One browser tab shows a spreadsheet in which the participant has to enter data items related to particular expenses. However, instead of presenting the participant with one or two tasks, the participant is presented with all 50 tasks at once, and is free to schedule these tasks within the experiment however they wish. This change in the task paradigm was made to make it more likely to measure any changes in how people schedule tasks and interruptions. It also resembles the situation from Study 1 and 2 where people have to schedule expenses tasks in an office setting. Each row in the spreadsheet corresponds to one expense. Two items for each expense have to be entered from a paper receipt. All paper receipts are stacked next to the computer. The other two items are retrieved by switching to two other browser tabs and looking it up in a table. The location of the correct data item in the table differs, and the participant does not know beforehand how long it is going to take to find an item: some may be quicker to find than others.

The between-participants independent variable is a notification. In the *notification* condition, the participant receives a notification when switching between browser tabs. Before switching from the data entry tab, they receive a warning message (e.g. ‘It is recommended to not leave the data entry interface for more than 10 seconds’). When switching back to the data entry tab, they receive a message stating how long they were away from the interface (e.g. ‘You left for 6.4 seconds.’) In the *control* condition, participants receive no notification. At the end of the experiment, participants will be asked to guess their average time spent per switch to look up information.

Dependent variables are the ordering strategies (i.e. in what order do participants look up and enter data items), the number and duration of switches, people’s time estimates, task completion time and data entry errors.

This study aims to address the following research question: does feedback on time spent on an interruption have an influence on the number, duration and timing of subsequent switches?

**Participants**

Thirty participants will take part in the study. The study will take approximately 45 minutes, and participants will be reimbursed with £7.50 for their time.

**Materials**

Participants have to complete 50 data entry tasks, and for each task have to enter four items (see Figure 1). The experiment will be conducted in a web browser, and the notification is implemented as a Chrome extension browser plug-in using HTML and JavaScript. Upon switching between browser tabs, a notification will appear at the right-hand corner of the screen. All key presses, tab switches and their corresponding timestamps are recorded using JavaScript. The tab switch timestamps will be used to determine the number and duration of switches away from the data entry tab.

**Results (expected)**

* As the experiment progresses, participants in the notification condition will enter items with the lowest time first. In the control condition, participants will complete the form in sequential order.
* Participants in the notification condition will make fewer visits to a tab associated with the highest switch time.
* Participants in the notification condition will make longer visits to a tab associated with the highest switch time.
* For participants in the notification condition, there will be a smaller difference in time estimates and actual durations of switches.

**Discussion**

The contribution of this study is showing that, in addition to knowing interruption length *before* an interruption, people also learn to adapt to information access costs if they receive feedback *after* the interruption has taken place.

**Study 2 – field study**

In order to understand whether the notification will work in a less controlled setting, the study will be replicated with data entry workers doing expenses work. They will be asked to install the plug-in in their browser and use it when they are processing expenses. Participants can use the add-in to select the browser page which shows the expenses system as the ‘main task page’. Every time they switch away from this page, or if the page is inactive for more than x seconds, a JavaScript event will be triggered to log the timestamp. This event will be triggered again when the user returns to the page. The timestamps will be used (and stored in an online spreadsheet?) to determine the number and duration of interruptions.

To observe the effect of time feedback, the participants will be divided into a control and experimental group.

The experimental group will be asked to install the plug-in and will receive a notification. If the main task page is not in focus, either because participants have switched to another page or if it has been inactive for x seconds, they will receive a notification with a warning message. Upon returning to the expenses page, they will receive a notification indicating how long they were away from the page. The control group will be asked to install the plug-in, but will receive no notifications. It is explained that the purpose of the study is to look at working patterns, and all participants will be able to see their own data at the end of the study.

Participants will be asked to use the add-in for one week in which they have to do a substantial amount of expenses work, and keep a diary of their expenses tasks. Within a week of finishing the diary, a follow-up interview will be scheduled to gather more detailed explanations of participants’ experiences of using the add-in.

The study aims to address the following research question: does feedback on interruption length have an effect on people’s self-interruption behaviour for expenses work in a finance office setting?

**Method**

**Participants**

Ten participants will take part in the study. They will be reimbursed with x for their participation. Participation will be limited to those who use a browser-based expenses system (e.g. UCL myFinance) and use Google Chrome, or are willing to install Google Chrome to be able to use the plug-in.

**Materials**

The task studied will be expenses tasks data entry workers carry out as part of their work, which is done in a browser. The same browser plug-in as in the first study will be used. Some expenses systems (e.g. UCL myFinance) typically get logged out after being inactive for 4 minutes. Therefore, the notification will give a warning that the data entry system will be logged out after 4 minutes.

**Procedure**

Participants will first complete an online survey asking about the context of their work and workplace. They will be sent the plug-in along with instructions how to install and use it. It will be explained what data will be logged and emphasised that no data entries will be recorded, that their data will be private, and that they will remain anonymous. They will be asked to use the plug-in for one week.

Participants will be instructed to work as they would normally, and to start the plug-in when they are about to start expenses work. They will be instructed to keep the plug-in running and turn it off when they are finished and/or switching to another work activity entirely. They will be sent a daily reminder to complete a short diary entry of their expenses tasks (if possible, perhaps a reminder as they turn the plug-in off?). To make it easier for them to understand what to enter, they will have to answer a few short questions:

1. How much time did you spend on this activity/how many tasks did you complete in one session?
2. Did you interrupt yourself at any point during the activity?
   1. What did you interrupt yourself for? Break, retrieve required information, interrupted by colleague, email notification, phone call, etc.
   2. How long did you think the interruption was approximately?
3. Were you able to complete all expenses you started during this session? If not, why not?

They then have the option to include more information in the diary entry, if they wish to do so.

After the week has finished, a semi-structured interview will be conducted. Participants will be shown a summary of their individual data showing their switching patterns, and asked to reflect on their switching behaviour. Participants in the experimental group will be asked about their impressions of receiving time feedback of their switches, and whether this had any impact on their behaviour. The interviews will last about 40 minutes, will take place at the participant’s workplace, and will be audio recorded and transcribed for further analysis.

**Results (expected)**

Measured:

* Participants in the *notification* condition will make shorter interruptions.

No quantitative measure available so has to be derived implicitly from interviews:

* Participants in the *notification* condition will make fewer interruptions to unrelated activities.
* If they learn the time of their interruptions, they will also finish completing the rest of the task first and defer interruptions until later in the task.

**Discussion**

The contribution of this study is showing that time feedback on interruptions helps people get insight into their interruptions which can help them better manage their interruptions during data entry work.



*(a)*



*(b)*

**

*(c)*

**

*(d)*

**

*(e)*

*Figure 1. Participants have to enter expenses into a data entry form (a). They retrieve these from paper receipts. Some items have to be retrieved by switching to another browser tab (b &d). Participants in the notification condition receive a warning message when they switch tabs. When they switch back to the data entry tab, they receive a message stating how long it took them (c & e).*