



MyTimeUse: An Online Implementation of the Day-Reconstruction Method

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Abstract

Time diaries can record precise measures of daily activities but few such diaries have been developed for use via the internet, which limits our knowledge of how social, economic, and demographic factors affect daily life and our ability to investigate trends over time. We have developed, refined, and deployed an original online time diary, mytimeuse.com, to study daily life in a longitudinal sample of graduate students and a longitudinal sample of U.S. residents recruited online. This article overviews the features we implemented to increase data quality and response rates. The diary is based on the day-reconstruction method, which has participants report on each primary activity in a selected day, then records further contextual information about the activity, such as social engagement, multitasking, and emotions. We recruited online participants to complete three time diaries and report their evaluations of our platform. Feedback indicates most participants found the diary to be intuitive and easy to use, and most who made an account with the diary platform fully participated in our study.

Keywords: online time diaries; online samples; day-reconstruction method; time use measurement innovations; original data collection

1. Introduction

Beginning as far back as Szalai and colleague's (1972) cross-national time-use research, daily life has continued to be studied around the world with time-diary surveys measuring the amount of time people allocate to different activities, where they spend this time, and with whom they spend it (Gershuny & Fisher, 2014). This approach has revealed insights that would otherwise be unavailable, such as the amount of time people allocate to all daily activities, time tradeoffs between activities, the sequencing of activities, and multitasking (Cornwell et al., 2019; Juster,

1985). This structuring of daily life is immensely important, given its relationship to disparities in employment status, marriage, health, and well-being between groups, across time, and across geography (NRC, 2012).

Social challenges—including recessions, climate disasters, war, and pandemics—are characterized in part by (often undesired) alterations to daily life (Sullivan et al., 2021). Obligatory time in paid work, household and care activities, and biological necessities (sleep, grooming) structure how and with whom individuals spend time (Robinson & Godbey, 1997). Unanticipated changes in obligatory time, like becoming unemployed and needing to social distance, rupture everyday routines. Studying these rapid changes and their consequences necessitates the use of agile methods to ensure data remain relevant as situations evolve. This need for agility and the availability of easily built surveys via Qualtrics, Survey Monkey, and similar survey platforms has made online research appealing. The rapid development and deployment of such surveys places them in sharp contrast to the relatively slow changing nature of government surveys.

The advantages of online research have led to a proliferation of research on COVID-19 (e.g., Chung et al. 2021; Kelley, Evans, and Kelley 2020; Park et al. 2020; Petts, Carlson, and Pepin 2020), yet the study of daily life through the kinds of tools available on general purpose survey platforms is highly limiting. Researchers are typically restricted to asking participants about their time use in broad, stylized measures resulting in biased and limited data on a small number of daily behaviors and interactions (Juster et al., 2003; Kan & Pudney, 2008; Sullivan et al., 2021). The specificity provided by time diaries is largely unavailable on platforms such as Qualtrics due to a lack of support for the complex design of time diaries.¹ Specifically, an online time diary must be detailed enough to be clear to participants, intelligent enough to detect participants' mistakes, and it must achieve these goals while keeping burden at a minimum—all of which requires implementing complex conditional logic (Minnen et al., 2014). These challenges are likely partially responsible for the slow development of online time diaries.

The present article overviews the development of our time diary and the ways in which we addressed each of these challenges, ultimately allowing us to extend the study of time use both within and beyond the domains which have fascinated time-use researchers for the past 60 years. It is currently available at www.mytimeuse.com.² This diary has been deployed to collect data on graduate students (Rinderknecht, Doan, and Sayer 2021) and in ongoing longitudinal research studying the effects of COVID-19 on daily life via the Assessing the Social Consequences of COVID-19 (ASCC) project³, where it has been made available to other researchers via collaboration. These projects focus on a broad range of daily life activities, which necessitated using a methodology capable of reliably measuring a full 24-hour timespan. The day-reconstruction method (DRM), which we implement, and which has participants retrospectively report their experiences, including emotions, across a 24-hour period, is ideally suited to this challenge compared to another approach to collecting activity and emotion data,

¹ Our discussion of our diary's capabilities in this article focuses on its ability to collect detailed, 24-hour time-diary data versus the much more limited capacities of general-purpose survey platforms, such as Qualtrics. It is useful to note that our time diary instrument is linked to a questionnaire fielded in a Qualtrics survey. This approach thus allows access to the benefits of Qualtrics, such as easily updating study instruments, sharing surveys with others for co-development, and "front-office" activities, such as customer support, while maintaining the ability to collect detailed 24-hour time diaries.

² Our diary is currently only available as a web app and requires an internet connection to function. A mobile app is under development.

³ Visit about.mytimeuse.com for more information about this project.

the experience sample methodology (ESM). ESM has participants report real-time data at multiple time points during a day in response to random prompts and therefore lacks full 24-hour coverage (Csikszentmihalyi & Larson, 1987; Gershuny, 2004). DRM is also generally easier to deploy than ESM approaches (Anusic et al., 2017), though the DRM approach also has drawbacks. Although generally less biased than commonly used retrospective measures asking participants to report typical occurrences over broad timescales, i.e. “stylized” measures (Juster et al., 2003), the retrospective nature of the DRM is still a potential source of response error (Hudson et al., 2020). By being a real-time measure, ESM is the gold standard against which DRM must be compared (Kahneman et al., 2004b), and such research generally finds DRM and ESM produce similar findings (Dockray et al., 2010; Kahneman et al., 2004b), though other work suggests the DRM approach may produce different results when looking at within-participant experiences (Lucas et al., 2021). Overall, researchers continue to evaluate the advantages and limitations of the DRM. Despite this, we chose to implement the DRM due to its 24-hour coverage, relative ease of deployment, and comparability with nationally representative DRM data, including the American Time Use Study Subjective Well-Being Module (ATUS WB Module) (Bureau of Labor Statistics, 2017; NRC, 2012) and the German Socioeconomic Panel Innovation Sample (SOEP-IS) (Anusic et al., 2017; Richter & Schupp, 2015).

In the sections that follow, we (1) discuss the mechanics of our diary and how it integrates with other survey platforms. We then (2) discuss our methods for reducing participant burden despite the collection of complex perceptual data for all non-sleep, grooming, and private personal activities reported in the diary. Reducing burden has been a central concern in the development of online time-diary platforms due to the ease with which online participants can (and do) exit studies (Zhou & Fishbach, 2016). Next, we discuss (3) our methods for maximizing instructional clarity in the context of online research, a crucial task because the research design does not involve interviewing. Then we discuss (4) the methodological innovations we have integrated into our time diary, namely our approach to measuring social engagement, secondary activities, and emotions, as well as our improvements on Kahneman et al.’s (2004b) original design. Following this, we (5) compare the features of our time diary with two other online time diaries, MOTUS and CaDDI. Lastly, we (6) report completion rates and participants’ feedback from recent data collected via samples recruited through Amazon’s Mechanical Turk (MTurk) and Prolific, both of which are popular online platforms for connecting researchers to participants (Peer et al., 2017).

2. Diary Overview

2.1. Diary Development and Deployment

2.1.1. Construction and Integration with Other Platforms.

Achieving our goals for reducing burden, increasing clarity, and implementing innovative methodological approaches required constructing a complex application beyond the capabilities provided by general purpose survey platforms (e.g., Qualtrics). Our implementation requires proficiency with Angular, a JavaScript framework for creating single-page applications.⁴ Although this provides us with the flexibility necessary to achieve our goals, it makes altering the diary significantly more challenging as compared to altering a

⁴ The back-end of our platform consists of a Python API which does not require alteration when the front-end JavaScript application is changed to fit the needs of a new study.

Qualtrics survey. Due to this, the time diary itself predominately includes only questions that are unlikely to change significantly between studies.⁵ Questions which are more likely to change (such as demographic questionnaires and follow-up surveys) are included in questionnaires fielded in Qualtrics surveys preceding and following participants' completion of the diary. However, although we make use of Qualtrics, participants' time-use data are connected to responses on these platforms in such a way that allow us to not be reliant on the particular features of any survey platform. This allows us to change survey providers if circumstance requires us to do so.

2.1.2. The Data Collection Process.

Our research design begins with researchers preparing the diary to accept new users (see step 1 in Appendix 1), followed by participants completing the introductory survey on Qualtrics (step 2). This survey ends with a link directing participants to our time-diary platform where they create an account to be able to complete the time diary across multiple sessions (step 3). Each diary completed on this platform (steps 4 – 9) concludes with a link directing participants back to a brief survey on Qualtrics (step 10). A detailed overview of each of these steps is available in the study flow diagram in Appendix 1. We discuss the mechanics facilitating this process below.

Conducting research with our platform first requires the researcher to create a “study” object in the form of JSON data submitted to the server, which includes data necessary for our platform to guide participants through our study. See step 1 in Appendix 1 for more information. Notably, this information includes which version of a time-diary instrument should be presented to participants. Although our diary is designed to not change often, we do have the capacity to design different variants of the diary when our study calls for unique, activity-level measures. For example, our research on graduate students (Rinderknecht et al. 2021) asked participants to report the extent to which their graduate student duties contributed to their own research aims, and our ongoing research on online workers asked participants to differentiate between working for a company and gig labor. Although these variants require JavaScript proficiency to produce, switching between variants is as simple as changing a value in our study's JSON file.

Once a study object is created on the server, the server returns a random string of characters: the study ID. When participants are presented with a URL to our time diary at the end of the introductory survey (see step 2 in Appendix 1), appended to this URL must be both the unique identifier connecting their time-diary account with their introductory survey data and this study ID. This allows an arbitrary number of participants to report time-use data concurrently, many of whom will receive different instructions (due to needing to report data on different days) and, potentially, report data using different variants of the time diary asking different activity-level questions.⁶

⁵ However, as we discuss later, we do have wide-reaching capacity to alter contextual questions to suit the needs of our study, including the inclusion of questions which appear or are removed based on complex conditional logic. Updating the list of activities available for selection by participants for different studies is also possible. Making these changes on our platform, though, currently requires JavaScript proficiency. This is an example the advantages and disadvantages of using our platform relative to platforms such as Qualtrics discussed in footnote 1.

⁶ Collecting survey responses on an external platform provides significant security advantages, in that it allows us to record sensitive participant information on this separate survey platform and never on our diary's server. Beyond this, we protect participant data via password protecting our API endpoints and through data deletion following study completion. Participants' passwords are further protected by being stored as salted hash codes. Plain-text passwords are never retained by our server. We ensure participant privacy via https encryption and by

In-line with the basic design of the DRM (Kahneman et al., 2004b), participants complete our diary by reporting their day in “episodes”, which are periods of time in which situational details, including primary activity and location, do not change. Participants begin the diary by reporting the first episode of the day, its duration, contextual details (unless it is a personal care activity, such as sleeping), and then repeat this process until they have reported on a full day. See steps 6-9 in Appendix 1 for more information.

Once the participant finishes a diary, they are presented with a link to report general information about the day, such as whether or not it was normal, and, if it was unusual, why (see step 10 in Appendix 1). The URL to this follow-up survey is derived from our study’s JSON file and appended to it is the participant’s unique ID linking them to their introductory survey response and the date of the time diary. These data are then easily inserted into the follow-up survey. For example, if the time diary was for a Tuesday, the follow-up survey can easily pipe “Tuesday” into the question “Was this a normal [insert day]”?

2.2. Methods for Reducing Burden

2.2.1. Same-day and Multi-session Reporting.

Early iterations of our diary needed to be completed by participants in a single session (i.e., in-progress responses were not saved, and participants therefore needed to complete the diary all at once). Given this design, the diary also had to be retrospective of the previous day, not earlier parts of the present day. Feedback indicated participants took issue with both restrictions. Participants desired to complete the diary as they proceeded through the day they were asked to report on instead of waiting until the following day, and they desired to have our platform save their progress in order to complete the diary at a more convenient time. Our diary now addresses both requests. Participants can begin to complete their time diary for the present day, up until the current time (i.e., they cannot report on episodes occurring partially or entirely in the future). They can finish the diary within the next two days; however, most of our research restricts data reporting to the current and following day by only presenting a link to the diary on the same day the diary is requested and the following day, and by including instructions on the homepage highlighting this restriction. Participants can access their data from multiple devices via a user account they are prompted to create at the start of our study (see section 2.1.2 and step 3 in Appendix 1 for more information). Theoretically, allowing participants to report daily activities closer to the time in which they completed the activity should produce more accurate responses (Pejovic et al., 2015). Figure 1 shows how participants can select the appropriate time diary.

not collecting detailed analytics on platform users. Our platform does not seek to connect users with any form of trace data (Cesare et al., 2018; Kashyap et al., 2022) originating outside of our platform.

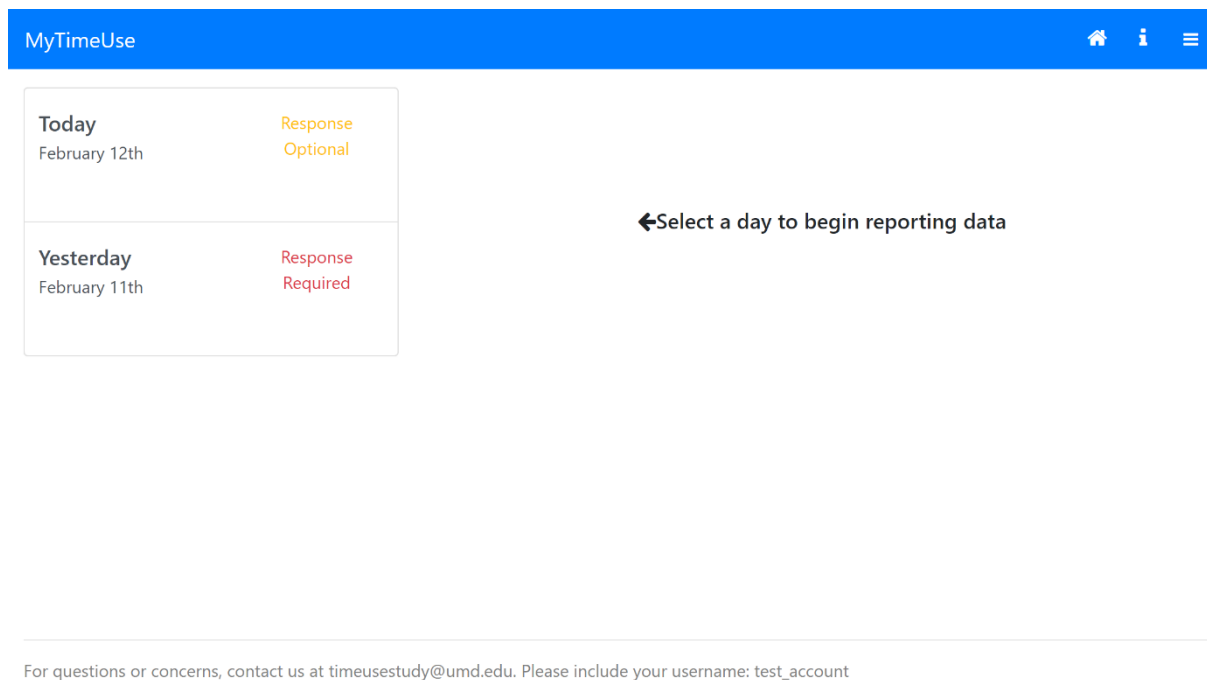


Figure 1 - MyTimeUse Homepage. In this example, the participant is able to report data for February 12th (until the current time) and February 11th

2.2.2. Custom Activity Recording.

Participants report an activity by typing what they were doing during the time period. As they type, the diary displays potential options for them to select. If no pre-provided option is appropriate, they can provide a “custom” activity which allows them to type whatever they like but requires them to code the activity (e.g., as Personal Care, Household Labor, Leisure). Once a participant creates a custom activity, this activity appears in the list of activity options presented to them in subsequent submissions. Participants are only required to code a custom activity during its first usage. Having participants providing their own coding aids in interpreting their data as well as facilitating other functions in the diary. For example, activities coded as Personal Care automatically remove all contextual questions, such as who else was present, where they were, secondary activities, and emotions. By saving their response, we avoid having participants need to repeatedly type out and code the same custom activity each time it is used. By allowing participants to report custom activities, we also avoid the potentially burdensome task of participants searching for a pre-provided activity they cannot find. See Appendix 5 for a visual overview of this process.

2.2.3. Desktop and Mobile Compatibility.

Designing web platforms for use on mobile devices is challenging. In a research setting, the challenges escalate due to the risk that common solutions for handling small screens embraced by other websites (i.e., removing/simplifying content) may lead to methodological issues. Simplifying instructions may lead mobile users to more often misinterpret questions. Similarly, if no effort is made to deliver a tolerable mobile experience, dropouts may be higher among demographic groups that are more likely to use mobile devices—such as Black and Hispanic individuals in the U.S. (Anderson, 2019). We facilitate mobile usage by utilizing Bootstrap 4 to make our platform responsive to screen size. (See getbootstrap.com for more information.) We address the issue of a lack of screen real estate for instructions by making some instructions

contextual and overlapping. For example, we provide a pop-up window to provide a description of each activity category. On a desktop, these instructions will typically appear to the right of the coding category, as shown in Figure 2. On mobile devices (or if the window is sufficiently narrow on a desktop), these same instructions overlap with the category options, as shown in Figure 3. In both cases, the instructions only appear once the category is selected and disappear if the category is selected again or if a different category is selected. Most instructions are also hidden once the participant finishes reporting their first diary episode but remain easily accessible for reference. See the section 2.3.1. for more information.

Which one of these categories most accurately describes "Washing dishes"?

Note: this question is only necessary if you do not select an existing activity option. Select each activity category below to see examples of appropriate activities for each category.

☐ Personal Care

☐ Work / Education

☐ Leisure

☐ Traveling

☐ Eating / Drinking

☒ Household Labor

☐ Caring for / Helping Others

☐ Consumer Purchases / Household Services

☐ Other

Household Labor

includes activities pertaining to maintaining your home and/or family (e.g. vacuuming floors, shoveling snow, laundry, cooking, putting away groceries, paying rent, general cleaning, yard work, and maintenance/repairs).

Figure 2 - Custom Activity Coding on Wide Displays. All text in this image is presented to participants.

Which one of these categories most accurately describes "Washing dishes"?

Note: this question is only necessary if you do not select an existing activity option. Select each activity category below to see examples of appropriate activities for each category.

☐ Personal Care

☐ Work / Education

☐ **Household Labor**
 includes activities pertaining to maintaining your home and/or family (e.g. vacuuming floors, shoveling snow, laundry, cooking, putting away groceries, paying rent, general cleaning, yard work, and maintenance/repairs).

☒ Household Labor

☐ Caring for / Helping Others

☐ Consumer Purchases / Household Services

☐ Other

Figure 3 - Custom Activity Coding on Narrow Displays

2.3. Methods for Increasing Clarity

2.3.1. Programmatic Instructions and Warnings.

Trial-and-error indicated that providing instructions on how to use the time diary via a training document prior to actually reporting data caused confusion among participants. Although we still include brief descriptions of what participants will do throughout the course of our study (see Appendix 2 and 3), finer details are now presented to participants as they report data. This improves clarity by reducing our reliance on participants remembering instructions, however it has the potential to become burdensome due to overwhelming participants with content when submitting data. To mitigate this, only the first activity participants report in a diary includes the full instructions for what they should be doing, and subsequent activities hide these instructions but allow them to be easily accessed again via an information button (i.e., a lower-case "i") on the relevant screen. See Figure 4 for an example of instructions during the first activity⁷ and Figure 5 for an example of instructions during subsequent activity submissions.

⁷ An astute reviewer pointed out that the example we gave in the instructions, eating lunch while working, could conceivably be viewed as eating being the primary activity and working being the secondary activity rather than working being the primary and eating being the secondary activity as the instructions currently specify. Ultimately, it is up to the participant to choose how to report the activities, but regardless, both activities would

See Figure 6 to see expanded instructions for activity reporting displayed after selected the information button.

What were you primarily doing at 12:00 AM?

The activity you report here should be the main activity you engaged in at midnight. You should not try to combine activities that occurred in separate blocks of time—for example, you should report "commuting to work" and "working at main job" as two separate activities. If you eat lunch at your desk while continuing to work, you would report the time as "working at main job" and include eating as a simultaneous activity on the next screen. If you were not doing any work or other activities while eating lunch, then eating lunch would be a separate activity.

Note that we are interested in both activities central to your day and mundane activities—like time spent grooming, eating breakfast, and waiting for the bus.

To view further instructions, select the **i** icon next to the textbox below.

i

Figure 4 - Instructions for Reporting the Primary Activity During First Activity Submission

What were you primarily doing at 7:01 AM?

i

Figure 5 - Instructions for Reporting Primary Activity During Next Activity Submissions

be recorded, and individual scholars may analyze both types of data as appropriate for their study. The instructions may also be changed for specific studies.

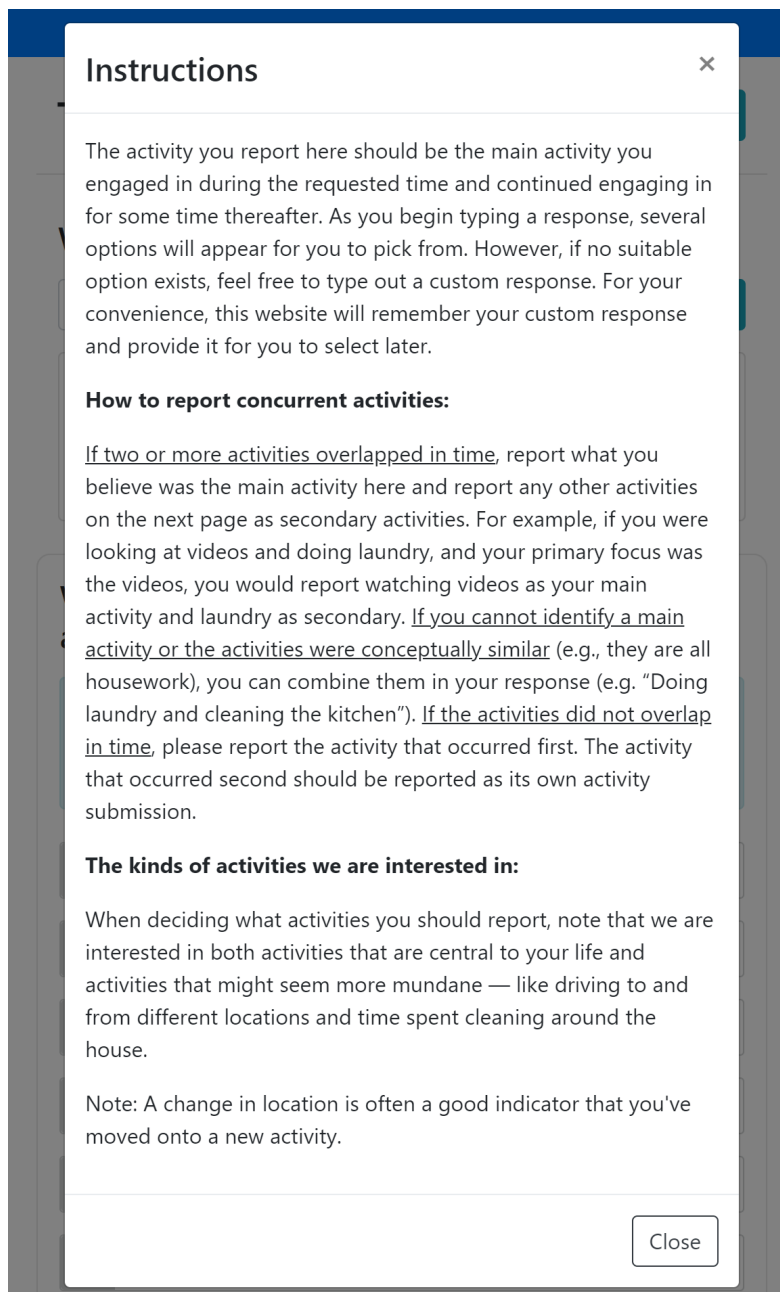


Figure 6 - Expanded Primary Activity Instructions

Warnings are presented to participants if they appear to not follow instructions. These warnings appear automatically if the participant appears to be double barreling a response (e.g., "eating and cleaning kitchen") or if the participant reports over six hours of time spent in a non-Personal Care activity. Figure 7 shows the warning that appears automatically if the participant's activity includes an "and", "&", or "P".

What were you primarily doing at 7:01 AM?

Eating and cleaning kitchen



This looks like multiple separate activities. If this is the case, please follow these instructions:

- If you are reporting multiple activities **that overlapped**, you should report the more significant activity here, and then report the other activity/activities on the next page.
- However, **if you cannot identify a main activity or the activities are conceptually similar** (e.g., they are all housework), you can combine them in your response (e.g., "Doing laundry and cleaning the kitchen").
- If you are reporting activities **that did not overlap** in time, you should only report the first activity here, and then report the other activity/activities as their own submissions (i.e., as main activities, not as secondary activities).

If no category is available, feel free to type a custom activity.

Figure 7 - Double-Barrelled Activity Warning

2.3.2. Daily Instructional Emails.

In addition to the instructions provided within the diary, we provide participants with reminders via email on each day the participant is allowed to report data. These emails include a link to time diary and a reminder that they are eligible to report data during the present day. Participants are also warned if it is the final day they will be allowed to report data. The process is conducted separately by the researchers, as opposed to being automated by our platform, due to how significantly contact procedures vary depending on the source used for participant recruitment.

2.4. Measurement Innovations and Deviations

2.4.1. Distinguishing Between Active and Passive Engagement.

Both time diary and experience sampling methods typically record the presence of others during an episode, and who these others were, but they rarely assess how participants engaged with these other people. We provide such finer detail by implementing the measures of active and passive engagement included in the PSID Supplement on Disability and Use of Time (DUST), which has participants distinguish between activities done with others (active engagement) and the presence of others not engaging in the same activity (passive engagement) (Freedman & Cornman, 2012). See Appendix 6 for an example of these questions.

2.4.2. Distinguishing Between Online and Offline Engagement.

If the participant reports actively engaging with anyone other than strangers or pets, instructions appear indicating the participant should "Select anyone you primarily engaged with via the internet or phone." The only response options provided are those which the

participant indicated they were engaging with actively, and the participant can indicate someone was engaged with online or by phone simply by selecting the appropriate associate category. Similarly, if the participant reports passively engaging with anyone other than strangers or pets, instructions appear indicating the participant should “Select anyone who was primarily present via the internet or phone.” Participants respond to this question in a same manner as the previously described question. See Appendix 7 for a visual overview of these questions.

2.4.3. Detailed Secondary Data.

People often engage in multiple activities simultaneously, yet many time diaries only focus on a small number of potential secondary activities, if any at all. ATUS, for example, only focuses on different forms of care work and eating in 2006-2008 and 2014-2016 when the Eating and Health Module was collected. Other activities that often occur as secondary activities, such as housework, screen time, and conversations, are uncounted when occurring during some other main activity (Phipps & Vernon, 2009). Our diary provides a wide range of secondary activity measures. The exact secondary activities vary depending on the needs of our study, but typically include options capturing employment-related activities, eating and drinking, media consumption, household labor, care work, and an “other” category in which participants describe their secondary activity via a verbatim response. Participants report the amount of time spent in each secondary activity via a sliding scale, representing the percent of the episode overlapped with the secondary activity. As participants move the scale, they are presented with both the percent value and the number of minutes this percentage represents. For example, if a participant reports eating breakfast as a main activity for 30 minutes and reports caring for / helping others for a quarter of that time, they will see this represents “approximately 8 minutes.” Figure 8 shows how these questions are presented to the participant.

Household Labor

✓ Caring for / Helping Others

Caring for / Helping Others includes caring for, assisting, and/or entertaining children as well as caring for and/or assisting adults.

What percent of the time were you helping others while "Eating breakfast"?

25% (approximately 8 minutes)

Other

Figure 8 - Reporting Secondary Activities

We provide participants with both the percent of the main activity and the total number of minutes due to some situations being easier to conceptualize with one option or the other. If a participant knows they checked their email for about five minutes while watching a two-hour movie, that time use will likely be best understood in minutes. If they spent a third of that time ironing, that time use will likely be best understood as a percentage.

2.4.4. Theoretically Informed Emotion Categories.

After providing information about activities and activity partners, we ask participants how they felt during the episode. Although designed to probe how participants felt in response to situations, measures in prior time-diary research tend to focus on broad categories of affect, e.g., happiness and sadness, designed to capture the proportion of daily time that an individual experiences positive compared to negative emotions (Krueger et al., 2009). We take a different approach to capture more detailed and theoretically informed emotional responses to activities. The contours of what an emotion is remains up for debate (Izard, 2010). Sociologists of emotions generally view emotions as involving some combination of physiological changes, situational factors, labels to identify the emotion, and expressive gestures (Thoits, 1989). Drawing on affect control theory and work on the dimensions of social emotions (Heise & Calhan, 1995), we ask participants to report their emotional states using a measure based on multidimensional scaling of the valence, arousal, and power ratings of common emotion words (Heise, 2001; Heise & Weir, 1999). These emotions scale into eight emotion sectors based on their substantive similarities across these three dimensions.

Together, these emotion sectors – shame, anxiety, sadness, bitterness, anger, happiness, calmness, and excitement – capture the variation in emotional experiences according to affect control theory (Heise, 2007). We also allow participants the ability to select “no emotion.” After they select one or more emotions (they cannot select “no emotion” and something else), they are asked for the intensity of these emotions on a 1 to 7 scale representing “not at all” to “very.” By drawing on the sociology of emotions literature and theoretical insights within it, we hope to standardize the measurement of emotions in time use research. There is strong evidence that emotions vary across both activities and demographic groups (Milkie et al., 2021; Musick et al., 2016), but a theoretically informed and consistent way of measuring emotions is needed going forward.

Although our approach differs from prior work, we maintain comparability with prior work by asking four of the six emotion measures used in the ATUS. Because these emotion categories include happiness and sadness, we do not ask these items again. ATUS uses six subjective well-being measures asking participants how happy, meaningful, sad, tired, stressed, or in pain they felt during randomly selected activities throughout the day (Hofferth et al., 2020). Although this measure is significantly associated with health and generally had high reliability (Lee et al., 2016), some have questioned these measures in particular because there is little documentation or justification of the measures compared to other affective measures (Diener & Tay, 2014).

2.4.5. Simultaneous Reporting of Activity and Context.

Kahneman et al. (2004b)’s day-reconstruction method diary first asked participants to recount their day as a continuous series of episodes, each of which were oriented around a primary activity. Participants were next asked to provide contextual information for each of these episodes. Kahneman et al. report utilizing this approach by claiming knowledge of these contextual questions may “affect the reconstruction of the previous day and may introduce selection biases” (Kahneman et al., 2004a: 4). In contrast, our diary has participants report contextual information for an episode prior to reporting subsequent episodes. We take this approach for several reasons. First, our programmatic warnings help instruct participants on the kinds of activities they should report, and these warnings would not be feasible in Kahneman et al.’s original design. The warning against double-barreling responses requires disclosing the existence of secondary activities. Our warning against reporting overly long activities includes information on shorter activities that may have occurred within this timespan

and ought to be reported as their own primary activities, and this warning relies on contextual information to display, specifically start and stop times. Beyond this, implementing Kahneman et al.'s original design would have conflicted with our method for allowing participants to report data regarding their current day, up until the current time. The advantage of hiding contextual questions from participants would also be undercut by the longitudinal design of much of our research, given that questions hidden during the first time diary would be known to participants prior to completing subsequent time diaries.

2.5. Comparisons to Other Online Time Diaries

There are two main approaches adopted by existing online time diaries: the survey-like approach utilized by MOTUS (Modular Online Time Use Survey) and the click-and-drag approach utilized by CaDDI (Click-and-Drag Diary Instrument) (Minnen et al., 2014; Sullivan et al., 2020).⁸ Of the two, our diary is most similar to the survey-like approach (for an overview, see our description of the DRM in section 2.1.2). The click-and-drag approach has participants complete their diary by first having participants report all primary activities completed during a day. Participants do this by selecting the appropriate activity and dragging it horizontally until it spans the appropriate amount of the day, then participants continue this process for all subsequent primary activities. Next, participants report contextual details, such as social engagement and secondary activities, in the same manner after reporting all primary activities. This approach requires participants to complete fewer pages of questions relative to the survey-like approach and therefore may be less burdensome than our diary and MOTUS (Sullivan et al., 2020).

Compared to our diary, MOTUS and CaDDI are similar in their ability to facilitate conditional behaviors, such as presenting questions and warnings when specific conditions are met (Minnen et al., 2014; Sullivan et al., 2020). Both MOTUS and CaDDI appear flexible enough to implement our detailed affective and social engagement measures if desired. Also like our diary, both MOTUS and CaDDI emphasize smartphone compatibility (Center for Time Use Research, 2022)—and MOTUS in fact goes a step further than our diary by providing a mobile app, as opposed to our approach which currently relies exclusively on a web app. Also like our diary, MOTUS supports participant responses across multiple sessions by saving responses (Minnen et al., 2014).

One central feature which distinguishes our diary from both MOTUS and CaDDI is that both platforms appear to restrict participants to only reporting time-diary data beginning on the following day, rather than allowing participants to report on a current day, up until the current time, as is possible in our diary. However, this feature appears compatible with the survey-like approach used by MOTUS. We plan to assess the data quality benefits of this innovation in future research.

2.6. Diary Evaluation

2.6.1. Sample Overview.

We assess our time diary by examining participant completion rates and platform evaluations from a sample recruited from MTurk and Prolific. We ensure high data quality by requiring positive reputations (Peer et al., 2014) and by following procedures for excluding users who mask their true location through virtual servers (Winter et al., 2019). Participants received \$4

⁸ Note that, as with our comparisons to general-purpose survey platforms (see footnote 1), our comparison with MOTUS and CaDDI focuses narrowly on the process of collecting retrospective, 24-hour diary data and not on ease of use for researchers and front-office activities. On these factors, MOTUS appears most developed given its status a company oriented towards facilitating customers' research.

for completing an introductory survey and \$6.50 for each time diary, up to three diaries in total. Lastly, participants received \$2.5 for completing a diary evaluation survey in which we collected the assessment data reported in this section.⁹ Apart from participants' estimates of diary completion time, all responses are on a 1 – 7 scale, where 7 indicates the greatest possible fairness/clarity/ease of use/ intuitiveness/enjoyment. The 301 participants who completed the diary-evaluation survey were 53% women, 73% white, 46% had a bachelor's degree or higher, 74% were either partially or fully employed, and the average age was 37 ($SD = 12$).¹⁰

2.6.2. Completion Rates.

400 participants completed our introductory survey by reaching the initial overview of the diary (see Appendix 2 for wording). 381 of these participants made an account with our platform, 314 completed at least one time diary, 224 completed all three diaries, and 301 participants completed the diary-evaluation survey asking for participant feedback regarding our platform. Participants were only invited to report feedback if they at least started a time diary, even if they did not finish it (338 in total). Overall, 95% of participants who read a description of our diary created an account with our platform, 82% of participants who created an account provided at least one complete diary, and 59% who made an account fully participated in all three days of our study.

2.6.3. Self-Reported Evaluations.

Participants reported each diary taking an average of 23 minutes ($SD = 14.39$) to complete. This is significantly faster than the 45 to 75 minute range reported by Kahneman et al. (2004b), yet the number of episodes reported by participants in completed diaries is roughly equivalent ($M = 13.36$, $SD = 5.69$ in our sample vs. $M = 14.1$, $SD = 4.8$ reported by Kahneman et al. (2004b)). This difference in duration may be due to our diary being easier to use. Alternatively, participants may understate their time use due to experiencing difficulty aggregating together the multiple moments in which they reported data. Another explanation pertains to the nature of our sample, which is more experienced at completing surveys than a typical sample. Direct measures of duration are unavailable due to complications in determining when participants started and stopped reporting data. Our episode count is also similar to research utilizing CaDDI (Sullivan et al., 2020), and exceeds the approximately 11 average daily episodes reported in the GSOEP-IS (Anusic et al., 2017), though is also lower than the approximately 18 average daily episodes reported in research using MOTUS (Minnen et al., 2014), the approximately 19 average daily episodes typically reported in the ATUS (Bureau of Labor Statistics & US Census Bureau, 2022), and the approximately 20 to 30 average daily episodes reported in pilot data collected by Eurostat in 12 countries (Rydenstam & Wadeskog, 1998). Although there is no absolute criterion for an acceptable number of average episodes (Rydenstam & Wadeskog, 1998), future work should be cognizant of the lower episode counts in data collected via our diary relative to data collected through several other diaries, as well as its potential implications for data quality.

Overall, participants reported their payment as quite fair for the amount of time and effort required in this study ($M = 6.63$, $SD = .87$). Participants also reported our study instructions as clear ($M = 6.57$, $SD = .73$), the diary as easy to use ($M = 6.41$, $SD = .94$), intuitive

⁹ Note that this diary evaluation survey is separate from the survey described in step 10, Appendix 1, in which participants report how typical their day was. Most studies using our diary do not include a diary evaluation survey due to logistical and cost considerations.

¹⁰ The demographic makeup of the larger sample consisting of the 400 participants who completed the introductory survey is almost identical. They were 53% women, 73% white, 47% had a bachelor's degree or higher, 76% were either partially or fully employed, and the average age was 37 ($SD = 12$).

($M = 5.9$, $SD = 1.21$), and overall reported our study as moderately enjoyable ($M = 5.3$, $SD = 1.46$).¹¹ Although these responses are promising, one important limitation is the lack of data from the 37 participants who at least started a diary but did not provide feedback, either because they were uninterested or because they did not see our study advertisement.

3. Conclusion

The past decade has seen a dramatic increase in the use of online samples in social scientific research, especially those from MTurk and, more recently, Prolific (Paolacci & Chandler, 2014; Peer et al., 2017). Our research finds that participants recruited from these platforms are amenable to time-diary research, yet it appears that little such research has been conducted with these participants. Of the 301 participants who responded to our diary-evaluation survey, 265 (88%) reported never having participated in a similar study.¹² This is consistent with the broader avoidance of crowdsourced samples in sociology (Shank, 2016). We have developed and implemented our methods for reducing burden and increasing instructional clarity with an aim towards assisting time-use research in sociology and related fields in benefitting from the low-cost, high-quality data available through these platforms (Hauser & Schwarz, 2016; Peer et al., 2017), as well from more traditional, non-crowdsourced samples. The time diary we have constructed should be beneficial for a diverse array of time-use research, including research tracking changes in daily life in response to social challenges, and our methods should also be informative for others seeking to construct their own internet-mediated time diaries.

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¹¹ These values are all improved relative to our first diary which lacked our methods for reducing burden and increasing instructional clarity. 86 MTurk participants reported lower evaluations for clarity ($M = 5.47$, $SD = 1.45$), ease of use ($M = 5.07$, $SD = 1.84$), intuitiveness ($M = 4.97$, $SD = 1.79$), and enjoyed our study less ($M = 4.3$, $SD = 1.69$). We do not explore these changes further due to other important alterations in research design complicating the comparison, most notably the inclusion of experience sampling in the earlier diary design.

¹² Specifically, we asked them “Have you participated in research like this that asks you to report your activities and emotions?” with Yes/No as the response options.

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Appendixes

Appendix 1: Study Flow Diagram

1. Create a MyTimeUse Study

- Before beginning data collection, researchers must create a “study” object on our platform. Each study consists of the information needed by our platform to guide participants through their participation. This information includes:
 - The instructional text presented upon account creation (see example in Appendix 3).
 - The days for which we are requesting data from participants.
 - The link they will be shown upon completing each time diary (see step 10).
 - An identifier signifying which variant of the diary to present participants.

2. Complete Introductory Survey

- This step occurs on an external survey platform (e.g., Qualtrics) and has participants respond to traditional survey items, such as mental health inventories and demographic measures.
 - Participant responses are downloaded from the external survey platform as a CSV file.
- Concludes by providing basic diary study overview (see Appendix 1).

↓
Participant is taken to
www.mytimeuse.com
↓

3. Account Creation

- Participants create their account by providing a username and password.
- No effort is needed from participants to link their introductory survey responses with their diary responses. Such linkage is instead accomplished by providing participants with unique links when directing them to our platform.
- Participants’ usernames and encrypted passwords are stored on our platform’s server.

4. Further Study Instructions

- After creating an account, participants are presented with instructions detailing what will be expected of them during our study. See Appendix 3 for an example of these instructions.

5. Platform Homepage

- The homepage highlights if any data are needed from the participant at that time. See Figure 1 for an image of the homepage.

↓
If data are needed
↓

6. Diary Homepage

- After selecting a day for which the participant can report data, the participant is redirected to the diary home page. If no activities have been reported, this page will

consist of a broad overview of what is expected from the participant (see Appendix 4 for these instructions). Participants can begin reporting an activity by selecting “Add Next Activity”. Each new episode will start one minute after the end of the previous episode. The first episode of the diary begins at midnight.

7. Activity Page #1: Basic Information

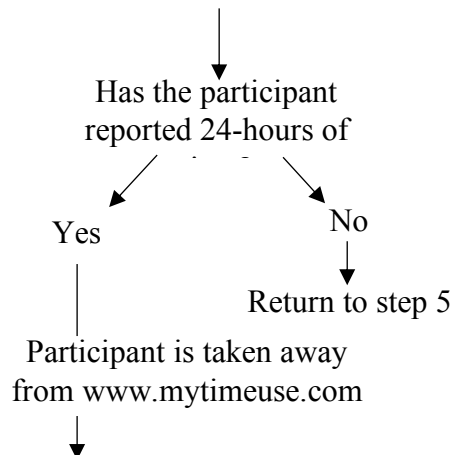
- Participants begin reporting an episode by reporting the activity they primarily engaged in, who they were with, where, and the duration of the activity. Other contextual questions are also recorded depending on the needs of our study.

8. Activity Page #2: Secondary Activities

- The next page asks participants if any other activities occurred during the primary activity (i.e., if any secondary activities occurred).

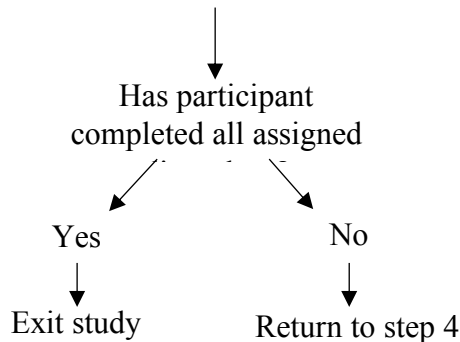
9. Activity Page #3: Emotions

- The next page asks participants questions regarding their emotional experiences during the episode’s timespan.
- After finishing this step, the entire episode is now saved automatically as JSON data on the server and is available for download by researchers.



10. Diary Day Overview Survey (i.e., the follow-up survey)

- Once participants finish reporting on their entire day, a link appears which directs them to the follow-up survey, which typically measures the extent to which the day was unusual relative to most other days.
- This step occurs on an external survey platform, and participant responses are downloaded from this platform as a CSV file.



Appendix 2: Preliminary Instructions

The following instructions appear on the final page of the introductory survey:

This stage will involve completing three time diaries. A time diary is an instrument that allows you to report on the activities you engage in as you proceed through a particular day. This is achieved by having you report on each activity you engaged in, the duration of the activity, and other data relevant to this time period. These data are valuable because they will give us a fine-grained view of factors important to your well-being, including work/life balance.

You have been assigned to complete a time diary on Saturday, February 22nd; Sunday, February 23rd; and Monday, February 24th. You can begin completing a time diary for a specific day on that same day, and you will be able to report data about that day up until the current time (i.e. you can tell us what you did earlier in the day, but you cannot report on activities in the future). To complete a time diary, you will need to report on all 24-hours of the day. This will require you to return to the time diary on the following day to finish providing data. This means that you will need to return to the diary on **Tuesday, February 25th** to complete your time diary for **Monday, February 24th**. For each time diary you complete, you will receive a \$6.5 / £5 bonus. This means that if you complete all three time diaries, you will receive a \$19.50 / £15 bonus. **In total, you will receive \$23.50 / £18 for fully participating in this study, as well as gain access to future studies only available to those who report on their daily activities.** You will receive bonus payments within five days of completing your participation in the final time diary.

Note that you can work on a time diary that covers the current day or the previous day, but you cannot provide data for a day that is beyond the previous day. For example, if you were completing a time diary for a Tuesday, you could work on that time diary on Tuesday and Wednesday, but not Thursday or later in the week.

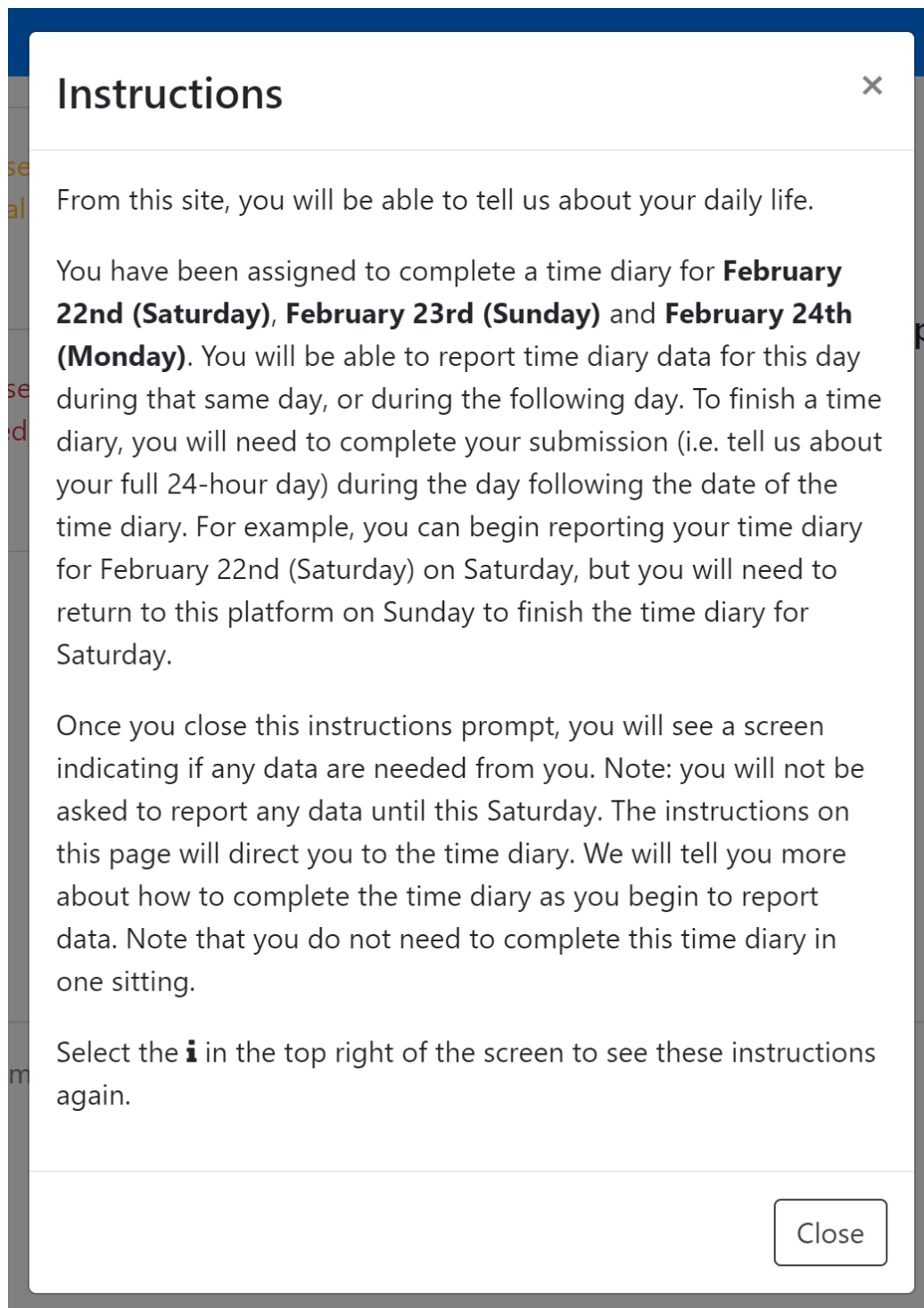
Lastly, we are interested in your time use even if the day you've been assigned is unusual and doesn't represent your usual time use. You will have the opportunity to report if the day was unusual, and why, at the end of the time diary.

We will send you email reminders on the day we are requesting data from you, as well as a reminder on the following day.

To begin, please follow this link to create an account with the time diary instrument. Please try to remember the account information you use, as this will be the same information you will use to provide time diaries for the remainder of the study.

Appendix 3: Further Study Instructions

Immediately after creating an account, participants are redirected to our platform's homepage, where instructions such as these are displayed:



Instructions ×

From this site, you will be able to tell us about your daily life.

You have been assigned to complete a time diary for **February 22nd (Saturday), February 23rd (Sunday) and February 24th (Monday)**. You will be able to report time diary data for this day during that same day, or during the following day. To finish a time diary, you will need to complete your submission (i.e. tell us about your full 24-hour day) during the day following the date of the time diary. For example, you can begin reporting your time diary for February 22nd (Saturday) on Saturday, but you will need to return to this platform on Sunday to finish the time diary for Saturday.

Once you close this instructions prompt, you will see a screen indicating if any data are needed from you. Note: you will not be asked to report any data until this Saturday. The instructions on this page will direct you to the time diary. We will tell you more about how to complete the time diary as you begin to report data. Note that you do not need to complete this time diary in one sitting.

Select the **i** in the top right of the screen to see these instructions again.

Close

Appendix 4: Diary Instructions

After selecting a day to report on, the participant is taken to the diary homepage, where the following instructions are presented:

Time Diary for February 22nd



Daily life involves progressing from one activity (e.g., sleeping, driving, watching TV, or eating breakfast) to another. To complete this time diary, you will need to report the activities you engaged in throughout the day. We will say more about these activities, as well as how to report multitasking, on the next page.

To begin reporting about this day, select the “Add Next Activity” button below. You will then be asked to report the first activity you engaged in during the day and further contextual details, depending on the activity. You will return to this screen once you have finished providing details for this first activity of the day. Your first activity submission will now be saved. Note that you do not need to complete this time diary in one sitting.

To see these instruction again and further instructions, select the  icon to the top right, next to the current time diary's date.

Add Next Activity

After reporting activities, the diary homepage looks like this:

Time Diary for February 22nd



Sleeping

12:00 AM to 7:00 AM

Getting dressed

7:01 AM to 7:14 AM

Making breakfast

7:15 AM to 7:25 AM

Add Next Activity

Remove Last Activity

Appendix 5: Activity Reporting

This is an example of the activity-reporting process. In this example, the participant has typed “breakfast” in response to the question “What were you primarily doing at 7:15 AM?” All pre-provided activities including the word “breakfast” automatically appear beneath the textbox as the participant types their response. The participant is directed to either select one of these pre-provided activities or code their verbatim activity response. The coding options disappear if a pre-provided activity is selected. Descriptions of activity coding options appear once selected (see Figure 2 and 3). The exact coding options vary depending on the needs of our study.

What were you primarily doing at 7:15 AM?



Eating breakfast

Making breakfast

Which one of these categories most accurately describes "breakfast"?

Note: this question is only necessary if you do not select an existing activity option. Select each activity category below to see examples of appropriate activities for each category.

Personal Care

Work / Education

Appendix 6: Active vs. Passive Engagement

This is an example of the distinction between active engagement (i.e., responses to the question “Who participated in this activity with you?”) and passive engagement (i.e., responses to the question “Who else was present?”). In this example, the participant reported active engagement with friends, as well as passive engagement with friends. This means that the participant engaged in the same activity as some friends, while other friends were present but engaging in a different activity. Note that “(Different)” is automatically added to any passive engagement response options when the corresponding active engagement response option is selected.

Who participated in this activity with you?

☐	Spouse/partner(s)
☐	Own child/children
☐	Other family member(s)
☐	Co-worker/colleague(s)
☒	Friend(s)
☐	Other People
☐	Pet(s)
☐	No one

Select anyone you primarily engaged with via the internet or phone:

☐	Friend(s)
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Who else was present?

☐	Spouse/partner(s)
☐	Own child/children
☐	Other family member(s)
☐	Co-worker/colleague(s)
☒	(Different) Friend(s)
☐	Other people

Appendix 7: Online/Phone vs. Offline Engagement

This is an example of how a participant would report the in-person presence of their own children and the internet- or phone-mediated presence of friends during an episode. The response options for the “Select anyone you primarily engaged with via the internet or phone” instructions are automatically populated by the participant’s response to the question “Who participated in this activity with you?”

Who participated in this activity with you?

☐	Spouse/partner(s)
☒	Own child/children
☐	Other family member(s)
☐	Co-worker/colleague(s)
☒	Friend(s)
☐	Other People
☐	Pet(s)
☐	No one

Select anyone you primarily engaged with via the internet or phone:

☐	Own child/children
☒	Friend(s)