Appendix
Mobile Assistance for Regulating Smoking Micro-Randomized Trial: Documentation on approach and considerations for deriving analytic datasets

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1. Background

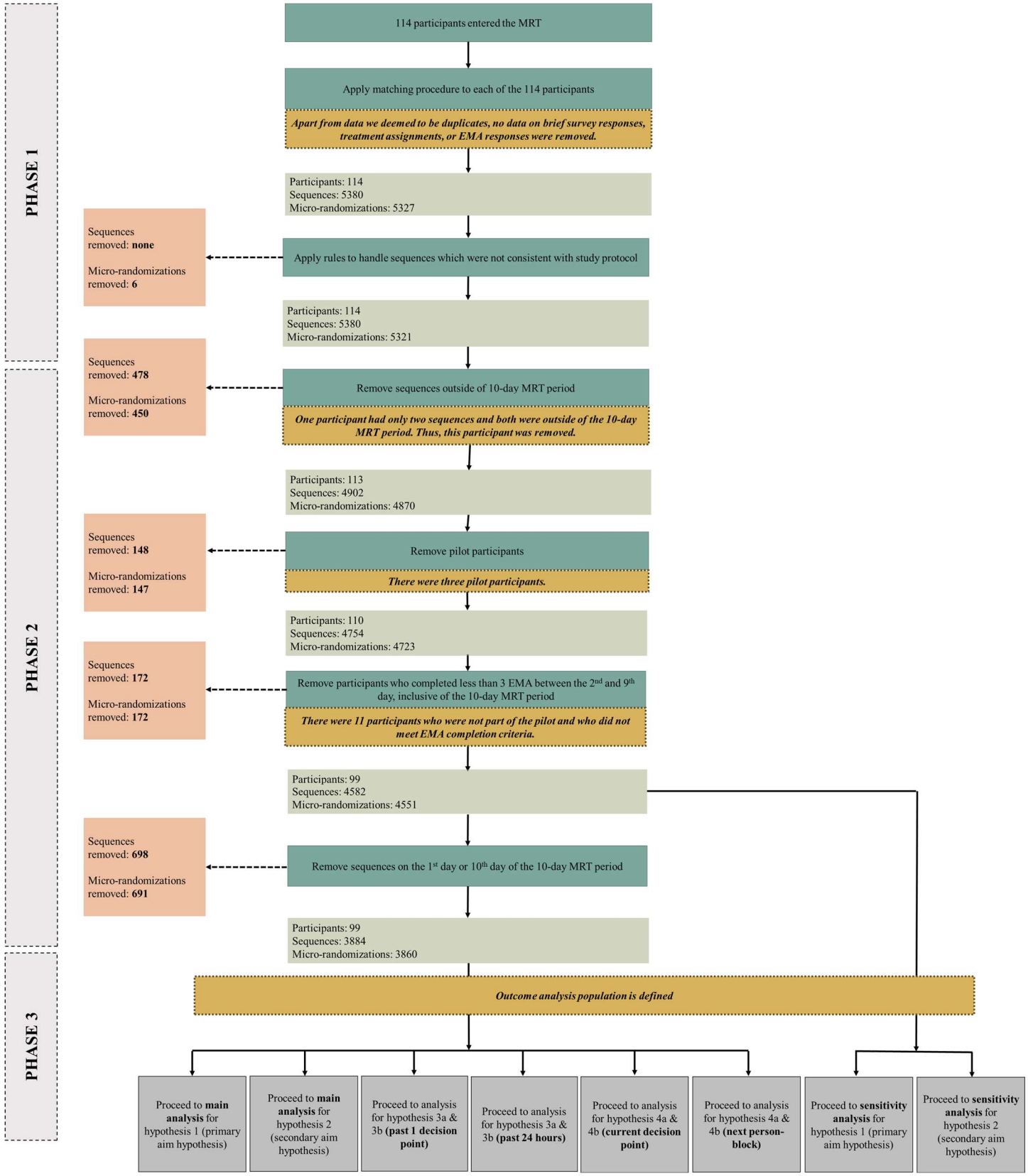
1.1 Overview

Our approach to deriving the analytic datasets has three phases:

- **Phase 1:** Applying a matching procedure
- **Phase 2:** Applying decisions common to all analyses
- **Phase 3:** Define outcome analysis population for each hypothesis

Figure 1 depicts data excluded at critical junctures of the process while Section 2 describes considerations underpinning decisions to exclude data. We used the 114 participants who were eligible to enter the 10-day micro-randomized trial (MRT) as a starting point for quantifying data excluded.

Figure 1: Participants, person-blocks, and micro-randomizations excluded from analyses.



Note: In Figure 1, ***sequences*** (described further in Section 2) pertain to the administration of brief surveys, micro-randomizations, and the administration of EMAs scheduled to occur in a common ***person-block*** (defined in Section 1.2).

1.2 Role of person-blocks in mHealth data collection

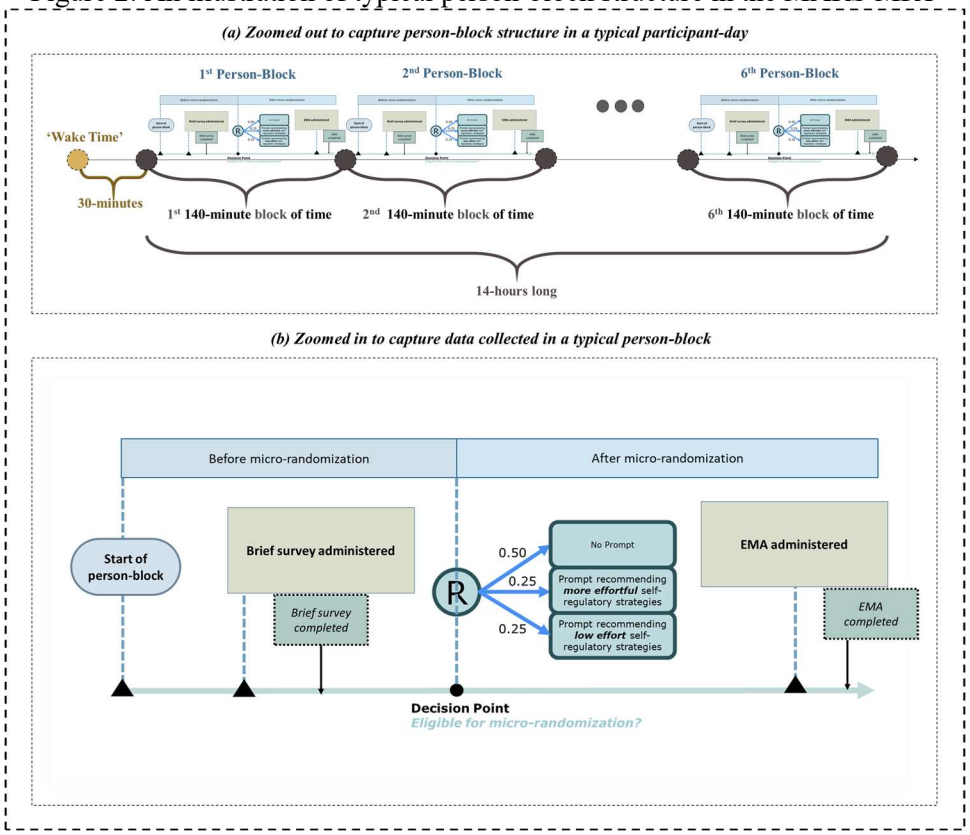
The scheduling of assessments and micro-randomizations described in the study's protocol (Nahum-Shani et al., 2021) was enforced by partitioning a day into six contiguous ***person-blocks***, each 140 mins long (≈2 hours). The first person-block began 30 mins after a participant's designated wake time. Person-blocks were used to space-out and place a cap on the frequency of assessments (brief surveys and EMAs) and micro-randomizations to a maximum of 1 of each per person-block; this cap led to a maximum of 6 of each per day. Within person-blocks, further restrictions were placed on the administration of assessments and micro-randomizations; in Algorithm 1 and 2, we display the restrictions followed within person-blocks. Algorithms 1 and 2 have the effect of restricting the number of feasible sequences to only three, displayed in Table 1. Apart from the intervention of study staff to calibrate smartphones to respect wake times, orchestrating the administration of EMAs and micro-randomizations was carried out solely by the smoking cessation app.

Table 1: Feasible sequences in person-blocks

#	Sequence
S1	Short survey administered (just once), no micro-randomization, no EMA administered
S2	Short survey administered (just once), micro-randomization (just once), no EMA administered
S3	Short survey administered (just once), micro-randomization (just once), EMA administered (just once)

As we will elaborate in the next section, the person-block structure is a crucial piece of information we sought to recover when deriving the analytic datasets for the primary aims manuscript. Figure 2 illustrates a typical participant-day in the MRT highlighting data collection with respect to the person-block structure.

Figure 2: An illustration of typical person-block structure in the MARS MRT



Algorithm 1: Overarching rule on administration of assessments and micro-randomizations followed within person-blocks

IF no brief survey has been administered yet
- **IF** passed restrictions [(a)]
  - Administer brief survey
  - **IF** a brief survey has been administered but no micro-randomization yet
    - **IF** passed restrictions [(b)]
      - Micro-randomize
      - **IF** a brief survey has already been administered & micro-randomized, but no EMA administered yet
        - **IF** pass restrictions [(c)]
          - Administer EMA
        - **ELSE** (**IF** did not pass restrictions)
          - Do not administer EMA
      - **ELSE** (**IF** brief survey has already been administered, micro-randomized, & EMA has already been administered)
        - Do not administer EMA
    - **ELSE** (**IF** did not pass restrictions)
      - Do not micro-randomize
  - **ELSE** (**IF** a brief survey has been administered and micro-randomized)
    - Do not micro-randomize
- **ELSE** (**IF** did not pass restrictions)
  - Do not administer brief survey

ELSE (**IF** a brief survey has already been administered)
- Do not administer brief survey

Note: Restrictions (a), (b), and (c) are identical and covered by Algorithm 2. See also note in Algorithm 2.

Algorithm 2: Restrictions (a), (b) and (c) in Algorithm 1 (i.e., restrictions (a), (b) and (c) were identical)

IF data for driving does not exist within 5 mins prior to *t** and data for sleep mode activation does not exist at *t**
- *PASS = TRUE*

ELSE IF data for driving does not exist within 5 mins prior to *t** but data for sleep mode activation exists at *t**
- **IF** sleep mode was activated at *t**
  - *PASS = FALSE*
- **ELSE** (**IF** sleep mode was not activated at *t**)
  - *PASS = TRUE*

ELSE IF data for driving exists within 5 mins prior to *t** and data for sleep mode activation does not exist at *t**
- **IF** driving within 5 mins prior to *t**
  - *PASS = FALSE*
- **ELSE** (**IF** not driving within 5 mins prior to *t**)
  - *PASS = TRUE*

ELSE (**IF** data for driving exists within 5 mins prior to *t** and data for sleep mode activation exists at *t**)
- **IF** driving within 5 mins prior to *t** or sleep mode was activated at *t**
  - *PASS = FALSE*
- **ELSE** (**IF** not driving within 5 mins prior to *t** and sleep mode was not activated at *t**)
  - *PASS = TRUE*

Note: 1. *t** denotes the specific moment Algorithm 2 was checked. 2. In some cases, when wake times might be after 10am (in the participant's local time), person-blocks on the current day cross over to the next day. In these cases, Algorithm 1 and 2 was not checked; moreover, administration of brief surveys & EMAs and micro-randomizations will automatically be forfeited. 3. Another situation when Algorithm 1 and 2 was not checked in a person-block was when participants neglected to keep their smartphones charged for the duration of the person-block. Administration of brief surveys & EMAs and micro-randomizations cannot occur while the smartphone remains uncharged.

2. Matching procedure (Phase 1)

2.1 Rationale motivated by challenges presented by the raw data

The lack of an evident person-block structure in the raw data motivated the development of a ***matching procedure***, also known as a ***record linkage*** (Fellegi & Sunter, 1969, Newcombe et al., 1959). Matching or record linkage refers to "bringing together of information from two records that are believed to relate to the same entity – for example, the same individual, the same family, or the same business" (Herzog, Scheuren & Winkler, 2007); records are brought together using "quasi-identifiers" which "do not uniquely identify [the person, business, etc.] by themselves but may, in combination, uniquely identify an entity [the person, business, etc.]" (Winkler, 2014). Our entity of interest is the person-block.

We started with raw data files where a clear-cut (exact) match to person-blocks was only evident for timestamps[1] corresponding to when brief surveys & EMAs were administered.

- Brief surveys: The clear-cut match came in the form of an explicitly recorded order in which the person-block occurred on a particular day (i.e., was it the 1st, …, 6th person-block on that particular day?) and explicitly recorded timestamps corresponding to when a person-block begun and ended (e.g., the 1st 140-minute long person-block on that particular day begun at 7:00am and ended at 9:20am[2]), both of which were already matched in the raw data to timestamps corresponding to when brief surveys were administered.

- EMAs: The clear-cut match came in the form of an explicitly recorded order in which the person-block occurred on a particular day which was already matched in the raw data to timestamps corresponding to when EMAs were administered.

Data which were important to carrying out the analytic plan did not have the same clear-cut match evident in the raw data; these included responses to brief surveys, treatment assignments, responses to EMAs, and timestamps corresponding to when micro-randomizations happened (which would be used to derive time-of-day and time-in-study variables). We note that since there was clear-cut labeling of data at the person level, it was only necessary to develop a matching procedure that would be applied to data at the person-block level (i.e., *within* each individual and not *between* individuals).

2.2 Rationale motivated by information we may leverage

Because smartphones loaned to each participant were configured so that brief surveys, micro-randomizations, and EMAs were all scheduled and administered solely by the smoking cessation app, a critical piece of information we leveraged was the person-block structure described in Section 1.2. In brief, our matching procedure is composed of a few deterministic decision rules which mimicked the logic obeyed by the smoking cessation app within each person-block. We discuss the result of the matching procedure in Section 2.3, and range checks diagnosing the adequacy of the matching procedure in Section 2.5.

2.3 Result of applying the matching procedure

The matching procedure yielded a dataset where a sequence of events is matched to the particular person-block they were intended to occur. More specifically, after applying the matching procedure to each of the

[1] Timestamps in the raw data could be converted into 'date-times'. A ***date-time*** is a date plus a time that uniquely identifies an instant of time to the nearest second, including time zones (Wickham et al., 2023).
[2] More precisely, these times were actually represented as date-times in the raw data.

114 participants who entered the MRT, we found that 5380 person-blocks contained any one of 10 possible sequences described in Table 1. Of the 5380 sequences, the vast majority were consistent with study protocol (99.76%; S1-S3 in Table 2), with a few exceptions (0.24%; A1-A7 in Table 1).

Data excluded: Apart from data we deemed to represent duplicates, no data on brief survey responses, treatment assignments, or EMA responses were removed by the matching procedure.

Note: It is possible for person-blocks to not contain any sequence. This scenario happens if a person-block had *(i)* no brief survey administered and *(ii)* no micro-randomization and *(iii)* no EMA administered. These person-blocks were not within the scope of our matching procedure but were accounted for when ascertaining the order (i.e., 1, 2, 3, …, 60) at which a person-block occurred (described in Section 4.4).

2.4 Handling sequences which were not consistent with study protocol

As we already observed in Table 2, there were rare cases of person-blocks containing sequences which were not consistent with study protocol. In all these cases, the inconsistency with study protocol was due to short surveys having been administered twice, and/or micro-randomizations having occurred twice, and/or EMAs having been administered twice within a person-block.

Decision: We dropped the first occurrence if short survey administration, micro-randomization, or EMA administration occurred twice within a person-block. In effect, applying this rule resulted in conforming sequences into what we would expect to see based on study protocol. The specific rules applied to cases A1-A7 in Table 2 are described in Table 4.

Data excluded: 6 micro-randomizations were excluded from all subsequent analyses (4 from A2, 1 from A6, and 1 from A7 in Table 3). Resulting number of person-blocks after applying the decisions in Table 4 to the 13 sequences not consistent with study protocol are reported in Table 3.

Table 2: Sequences of events resulting from applying the matching procedure to the raw data

	#	Sequence	Total person-blocks	
Consistent with study protocol	S1	Short survey administered (just once), no micro-randomization, no EMA administered	**5367**	58
	S2	Short survey administered (just once), micro-randomization (just once), no EMA administered		628
	S3	Short survey administered (just once), micro-randomization (just once), EMA administered (just once)		4681
Not consistent with study protocol	A1	Short survey administered (just once), micro-randomized (just once), EMA administered (1st time), EMA administered (2nd time)	**13**	1
	A2	Short survey administered (just once), micro-randomized (1st time), micro-randomized (2nd time), EMA administered (just once)		4
	A3	Short survey administered (1st time), short survey administered (2nd time), micro-randomized (just once), EMA administered (just once)		2
	A4	Short survey administered (1st time), short survey administered (2nd time), no micro-randomization, no EMA administered		2
	A5	Short survey administered (1st time), short survey administered (2nd time), micro-randomized (just once), no EMA administered		2
	A6	Short survey administered (1st time), micro-randomized (1st time), short survey administered (2nd time), micro-randomized (2nd time), EMA administered (just once)		1
	A7	Short survey administered (1st time), micro-randomized (1st time), short survey administered (2nd time), micro-randomized (2nd time), no EMA administered		1
		Grand total person-blocks (across all 114 participants)	**5380**	

Table 3: Resulting number of person-blocks applying decisions in Table 4 to the 13 sequences not consistent with study protocol in Table 2

		Number of person-blocks		
#	**Sequence**	**Number of person-blocks fter applying matching procedure to raw data (C1)**	**Additional person-blocks after applying decisions in Table 4 (C1)**	**Total person-blocks (C1+C2)**
S1	Short survey administered (just once), no micro-randomization, no EMA administered	58	2	60
S2	Short survey administered (just once), micro-randomization (just once), no EMA administered	628	3	631
S3	Short survey administered (just once), micro-randomization (just once), EMA administered (just once)	4681	8	4689
	Grand total person-blocks (across all 114 participants)	**5367**	**13**	**5380**

Table 4: Specific decisions for sequences of events inconsistent with study protocol

#	Original Sequence	Total Person-Blocks	Decision	Sequence after Applying Decision	
A1	Short survey administered (just once), micro-randomized (just once), EMA administered (1st time), EMA administered (2nd time)	1	Exclude EMA administered the 1st time within a person-block	Short survey administered (just once), micro-randomized (just once), EMA administered (just once)	S3
A2	Short survey administered (just once), micro-randomized (1st time), micro-randomized (2nd time), EMA administered (just once)	4	Exclude micro-randomizations which occurred the 1st time within a person-block	Short survey administered (just once), micro-randomized (just once), EMA administered (just once)	S3
A3	Short survey administered (1st time), short survey administered (2nd time), micro-randomized (just once), EMA administered (just once)	2	Exclude short survey administered the 1st time within a person-block	Short survey administered (just once), micro-randomized (just once), EMA administered (just once)	S3
A4	Short survey administered (1st time), short survey administered (2nd time), no micro-randomization, no EMA administered	2	Exclude short survey administered the 1st time within a person-block	Short survey administered (just once), no micro-randomization, no EMA administered	S1
A5	Short survey administered (1st time), short survey administered (2nd time), micro-randomized (just once), no EMA administered	2	Exclude short survey administered the 1st time within a person-block	Short survey administered (just once), micro-randomized (just once), no EMA administered	S2
A6	Short survey administered (1st time), micro-randomized (1st time), short survey administered (2nd time), micro-randomized (2nd time), EMA administered (just once)	1	Exclude short survey administered and micro-randomization which occurred the 1st time within a person-block	Short survey administered (just once), micro-randomized (just once), EMA administered (just once)	S3
A7	Short survey administered (1st time), micro-randomized (1st time), short survey administered (2nd time), micro-randomized (2nd time), no EMA administered	1	Exclude short survey administered and micro-randomization which occurred the 1st time within a person-block	Short survey administered (just once), micro-randomized (just once), no EMA administered	S2

3. Range checks

We used the 99 participants, 3884 sequences, and 3860 micro-randomizations at the end of Phase 2 (see Figure 1) to conduct the checks described in this section.

3.1 Range checks on timing of events within person-blocks relative to administration of brief survey or administration of EMA

We performed range checks on the following quantities:

Q1. the number of minutes elapsed between the time at which a brief survey was administered and when brief survey was completed
Q2. the number of minutes elapsed between the time at which a brief survey was administered and micro-randomization
Q3. the number of minutes elapsed between the time at which a brief survey was administered and the time at which EMA was administered
Q4. the number of minutes elapsed between the time at which EMA was administered and the time at which EMA was completed

Drawing from the study's protocol, we would expect that the value of Q1 ranges between ≈0-5 mins and in most cases be a few seconds, Q2 ranges between ≈0-5 mins and in most cases be a few seconds, Q3 ranges between ≈60-120 mins and in most cases be between ≈60-65 mins, Q4 ranges between ≈0-60 mins and in most cases be between ≈0-5 mins.

The quantities above, also illustrated in Figure 3, were calculated based on brief surveys, micro-randomizations, and EMAs which were matched to the same person-block by our matching procedure. For Q1 and Q4, only brief surveys and EMAs which were completed were used in the calculation (i.e., if they were partially complete or had no response to any item, they were not used in the calculation)

Our range checks diagnosed whether there were a significant number of person-blocks that violated these expected characteristics for the values of Q1, Q2, Q3, Q4; a large number of offending person-blocks may be symptomatic of an inadequate matching procedure.

Result of checks: We display the result of these checks in see Figure 3. Person-blocks in Table 4 were consistent with the characteristics of the distribution of Q1, Q2, Q3, Q4 that we would expect from study protocol.

Data excluded: No data was excluded as a result of these checks.

3.2 Range checks on the timing of responses to brief survey and EMA relative to micro-randomization

We performed range checks on the following quantities:

R1. the number of minutes elapsed between micro-randomization and the time at which a participant completed the brief survey administered in the same person-block as the micro-randomization
R2. the number of minutes elapsed between micro-randomization and the time at which a participant began responding to the EMA administered in the same person-block as the micro-randomization

Drawing from the study's protocol, we would expect that the value of R1 ranges between ≈0-120 mins and in most cases be almost instantaneous and that R2 ranges between ≈60-120 mins and in most cases be between ≈60-65 mins.

The quantities above, also illustrated in Figure 3, were calculated based on brief surveys, micro-randomizations, and EMAs which were matched to the same person-block by our matching procedure. Our range checks diagnosed whether there were a significant number of person-blocks that had values for either R1 or R2 that fell on the upper end of this range which would indicate the need to discard brief survey or EMA responses, respectively (i.e., regard as responses missing).

Result of checks: We display the result of these checks in see Figure 3. Person-blocks were consistent with the characteristics of the distribution of R1 and R2 that we would expect from study protocol, with rare exceptions (exceptions are represented by points above the solid red line in the plot for R2 in Figure 3).

Data excluded: No data was excluded as a result of these checks.

3.3 Range checks on the micro-randomizations

We calculated the empirical probability (and its 95% confidence interval) of being assigned to one of three possible treatment options among person-blocks where micro-randomization was feasible. This range check diagnosed whether there was any evidence that the randomization probabilities employed during the conduct of the study deviated from what we would expect from study protocol.

Study protocol: When it was feasible to micro-randomize within a person-block, the participant was micro-randomized (2:1:1) to:

- no prompt; or
- prompt recommending more effortful self-regulatory strategies; or
- prompt recommending low effort self-regulatory strategies

Therefore, if it were feasible to micro-randomize in all six person-blocks each day, participants would receive, on average, three prompts each day with equal representation of the two types of prompts.

Result of checks: We display the result of these checks in Figure 4. In all, these checks show that the empirical probability of being assigned to one of three possible treatment options is consistent with what we would expect from study protocol.

Data excluded: No data was excluded as a result of these checks.

Figure 3: An illustration of the correspondence between quantities checked and the person-block structure (*figure continued on next page*)

(a) Visualizing quantities we performed range checks on with respect to person-block structure

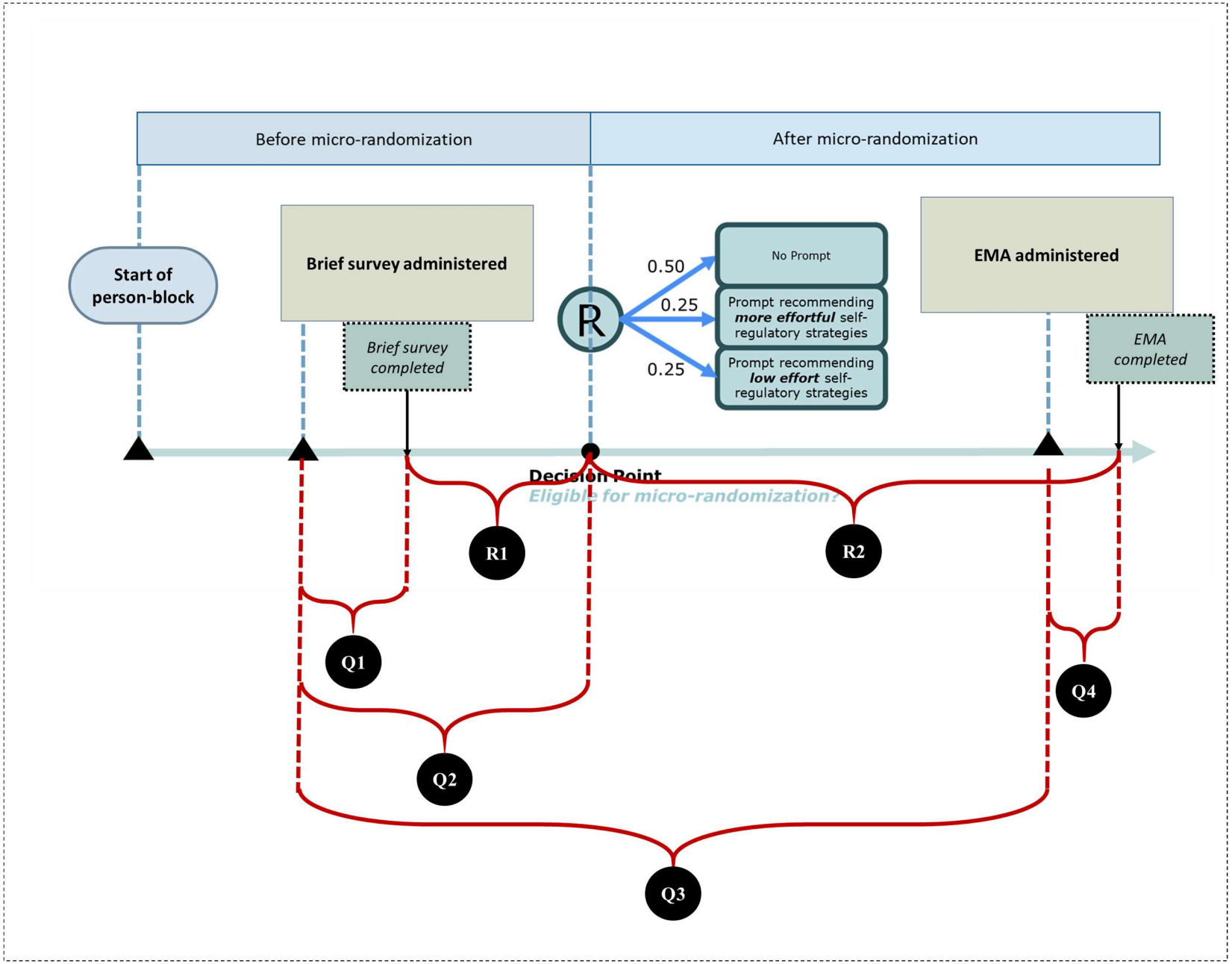


Figure 3: An illustration of the correspondence between quantities checked and the person-block structure (*figure continued from previous page*)

(b) Box plots display minimum, 25th percentile, 50th percentile, 75th percentile, maximum value of the quantities in each panel. Violin plots display the probability density of the quantities in each pane.

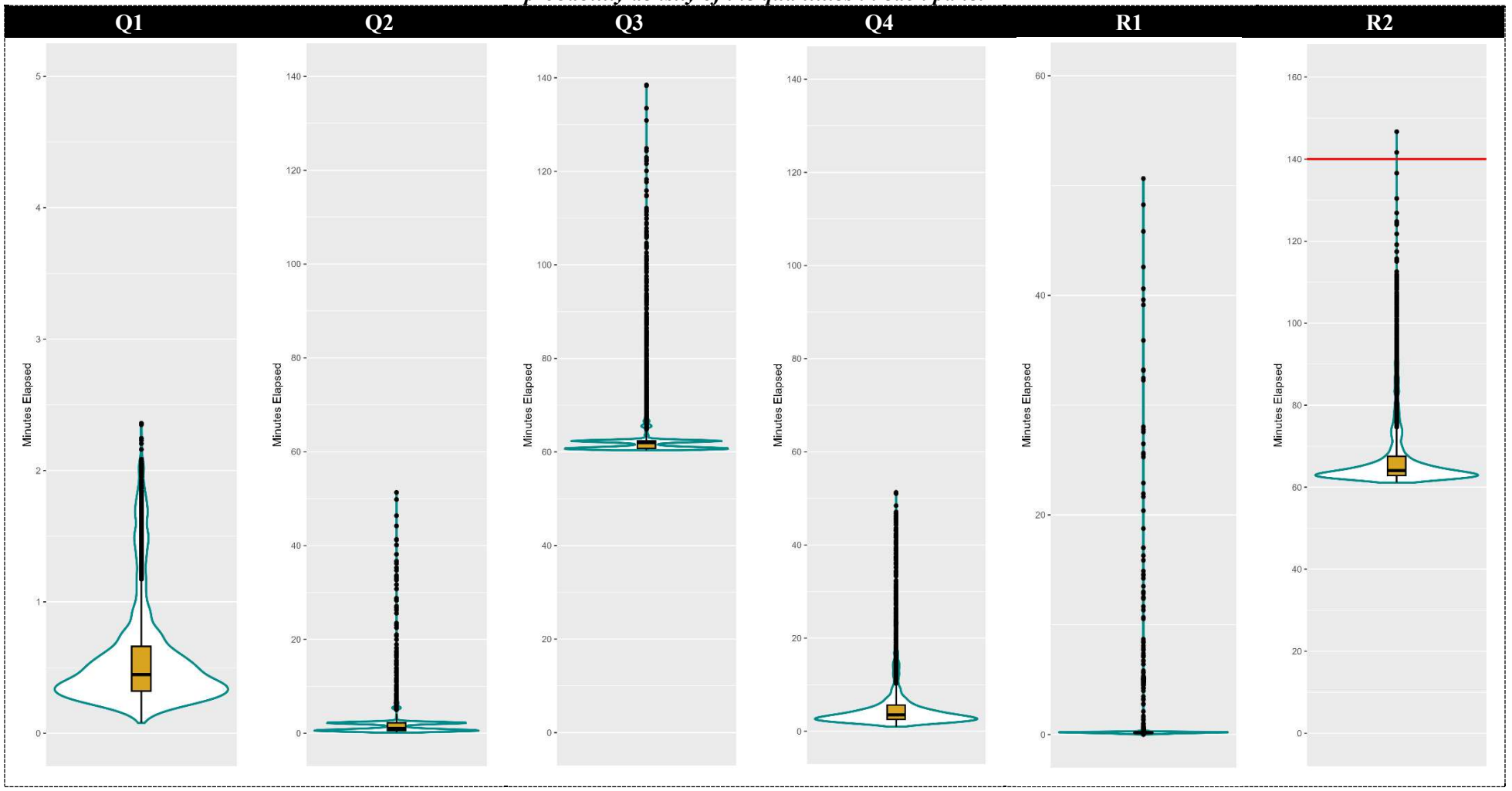
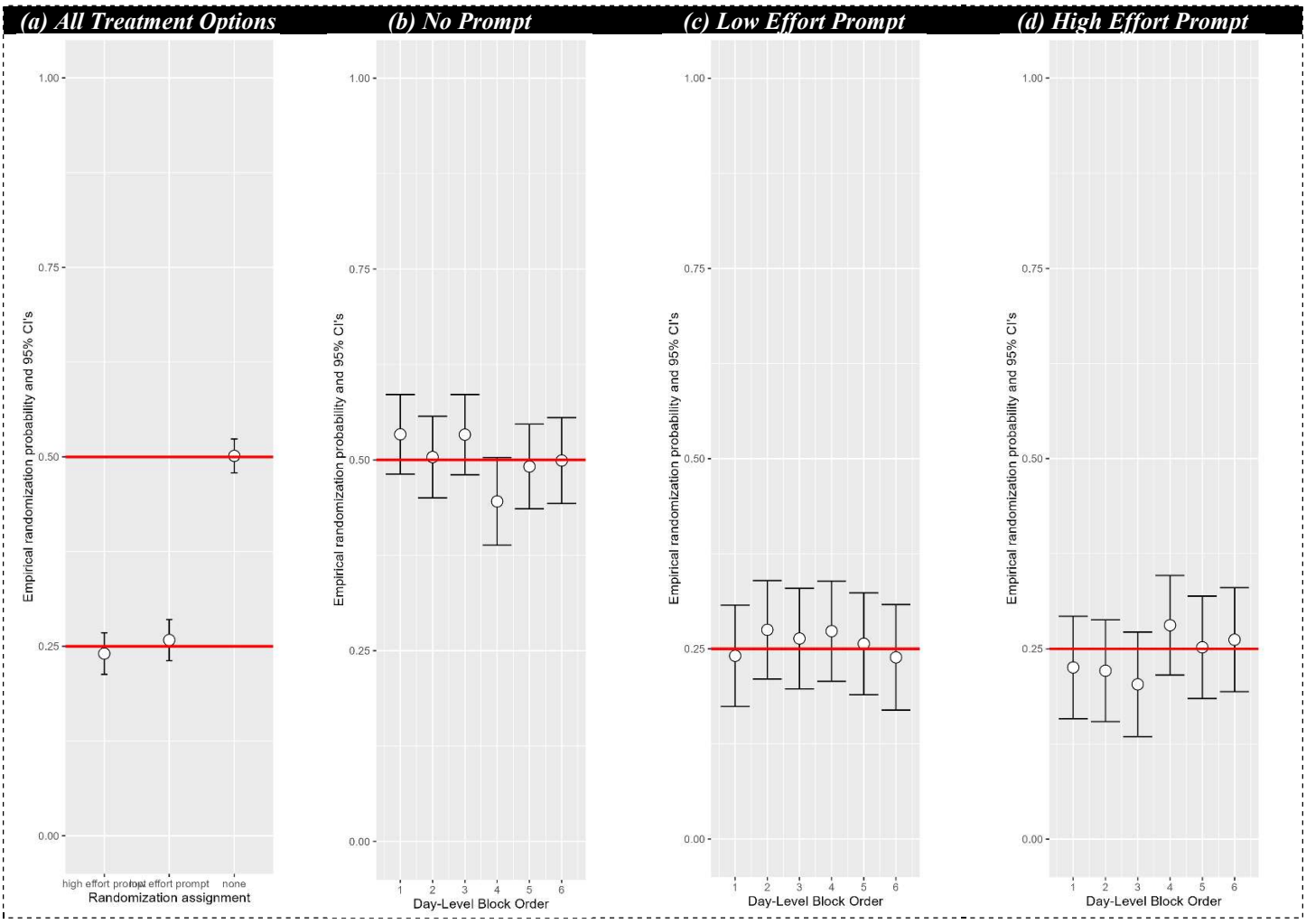


Figure 4: Among person-blocks where micro-randomization was feasible, the empirical probability of being assigned to no prompt, prompt recommending more effortful self-regulatory strategies, or prompt recommending low effort self-regulatory strategies. In panel (a), the calculation was not restricted to only the 1st, 2nd, …, 6th block of the day; on the other hand, in panels (b), (c), and (d), the calculation was restricted to only the 1st, 2nd, …, 6th block of the day.



4. Decisions common to all analyses (Phase 2)

4.1 Handling sequences which occurred outside the 10-day MRT period

A number of sequences in Table 3 occurred in person-blocks that began either before or after participants' designated 10-day MRT period; sequences contained in these person-blocks also do not necessarily represent participant data. This situation is due to study procedures and the fact that study staff cannot pause data collection performed by the smartphone remotely; more specifically,

- Smartphones could collect data (e.g., by continuing to micro-randomize) after the designated 10-day MRT period as they are being mailed back to study staff, or as study staff wrap up study procedures after receipt of the returned smartphone.
- Smartphones could collect data (e.g., by beginning to micro-randomize) before the designated 10-day MRT period as study staff prepare smartphones to be re-used prior to mailing the smartphone to subsequent participants or as the participants inspect the smartphone after receiving it in advance of the 10-day MRT period

Decision:

- For each participant, a sequence was removed if it was contained in a person-block that began outside of the participant's designated 10-day MRT period.
- We operationalized their ***First Day*** and ***Last Day*** of a participant's designated 10-day MRT period to be the date when they met study staff for their 1st visit and nine days after their First Day, respectively. The Last Day coincided with their 3rd visit.

Data excluded: We used participants and sequences that remain at the end of Phase 1 as a starting point for quantifying data excluded. In this step, 478 sequences and 450 micro-randomizations were excluded from all analyses.

4.2 Handling participants who were part of the pilot run of the study

Decision: Participants who were part of the study's pilot run were be excluded from all analyses.

Data excluded: We used participants and person-blocks that remain at the end of Section 4.1 as a starting point for quantifying data excluded. In this step, 148 sequences, and 147 micro-randomizations were excluded from all analyses.

4.3 Handling participants who did not meet threshold for EMA completion

Decision: Participants who did not complete at least 3 EMA between the second day and ninth day, inclusive, of their designated 10-day MRT period be excluded from all analyses.

Data excluded: We used participants and person-blocks that remain at the end of Section 4.2 as a starting point for quantifying data excluded. In this step, 172 sequences, and 172 micro-randomizations were excluded from all analyses.

4.4 Ascertaining order of person-blocks

Recall from Section 2.1 that the order in which person-blocks occurred in a participant-day (or ***day-level block order***, for brevity) was explicitly recorded in the raw data. Unfortunately, this record is incomplete:

- If a person-block did not contain any sequence, then neither timestamps corresponding to when the offending person-block begun and ended, nor day-level block order of the offending block was necessarily[3] recorded in the raw data.
- Study staff did not keep manual records of participants' designated wake-times (information was discarded after calibrating smartphones to respect wake times).

Therefore, we deduced the order of person-blocks within each participant's designated 10-day MRT period (or ***study-level block order***, for brevity) in two steps (see Figure 5):

- **Step 1:** Using only those person-blocks which had a brief survey administered as our starting point, we used Equation 1 to deduce study-level block order.
- **Step 2:** We simply fill in the gaps to deduce study-level block order for the remaining person-blocks (none of which had a brief survey administered) in the 10-day MRT period.

Notation:

- t denotes study-level block order, which ranges between 1 to 60
- b denotes day-level block order coded as 0, 1, 2, 3, 4, 5
- δ_t denotes number of days elapsed between midnight of the date of 1st visit and date-time[4] corresponding to the start of the t^{th} person-block
- $\lfloor \delta_t \rfloor$ denotes rounding down the value of δ_t to the nearest integer

Equation 1: $t = 6\lfloor \delta_t \rfloor + (b + 1)$

Having the complete sequence on hand would now allow us to correctly align person-block data between participants and carry out analyses that require this information. In particular,

- when creating the multiply imputed datasets
- when carrying out analyses that utilize moderators operationalized in terms of responses in person-blocks just prior to the current person-block (Hypothesis 3a & 3b)
- when carrying out analyses that utilize a proximal outcome operationalized in terms of responses in person-blocks right after the current person-block (Hypothesis 4a & 4b)

Data excluded: None at this step; however, this step allows us to appropriately define the outcome analysis population for each analysis (see Section 5).

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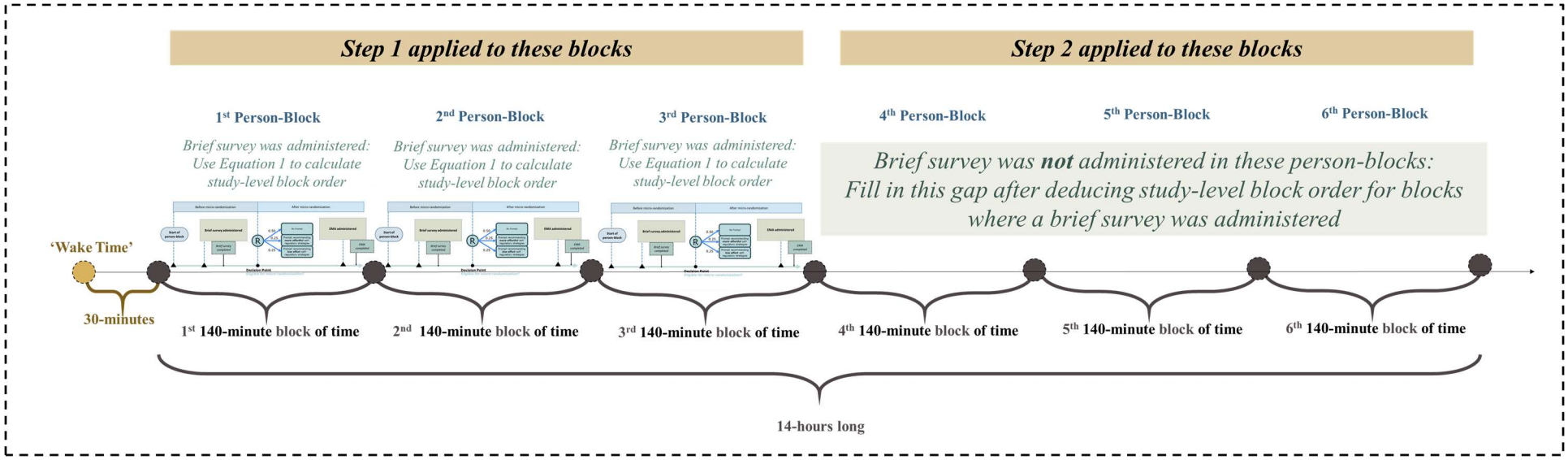
[3] If it happened that the smartphone was not charged for the whole day, then this information will not be recorded in the raw data for that day. If it happened that the smartphone was only charged before a participant's designated wake time (but not charged for the rest of the day), then this information might be recorded.

[4] Recall that a date-time is a date plus a time that uniquely identifies an instant of time to the nearest second, including time zones. All calculations in Equation 1 were carried out in the participant's local time.

Figure 5: An illustrative example of the implementation of the two-step procedure described in Section 4.4. In this illustrative example, only the 1st, 2nd, and 3rd person blocks had a brief survey administered.



4.5 Handling sequences on the First Day and Last Day

Decision: For each participant, a sequence was removed if it was contained in a person-block that began either on the First Day or Last Day of the participant's designated 10-day MRT period. This decision was operationalized by removing a sequence if it was contained within the 1st through 6th or 55th through 60th person-blocks.

Data excluded: We used participants and person-blocks that remain at the end of Section 4.3 as a starting point for quantifying data excluded. In this step, 698 sequences, and 691 micro-randomizations were excluded from all analyses.

Sensitivity analysis: We will perform a sensitivity analysis for Hypothesis 1 (Primary Aim Hypothesis) and Hypothesis 2 (Secondary Aim Hypothesis) where hypotheses will be tested using all sequences contained in person-blocks that began at any time in a participant's designated 10-day MRT period, including the First Day and the Last Day (i.e., if a sequence was contained within the 1st through 6th or 55th through 60th person-blocks, it was not excluded).

5. Defining the outcome analysis population (Phase 3)

We used the 99 participants, 3884 sequences, and 3860 micro-randomizations that remain at the end of Phase 2 as a starting point for defining the outcome analysis population in Phase 3.

To facilitate conceptual clarity, we define the outcome analysis population in two steps: in the first step (described in Table 5), we define the 'ideal' outcome analysis population had participants always completed EMAs in person-blocks where they were eligible for micro-randomization; in the second step (described in Table 6), we specify where missing data occur which leads us to the actual definition of the outcome analyses population used in complete case analyses.

We use the following notation in Table 5 and 6:

- t denotes study-level block order, which ranges between 1 to 60
- I_t denotes whether the t^{th} person-block was eligible for micro-randomization whose value is 1 if eligible and 0 if not eligible
- n_t denotes the number of person-blocks prior to t (not including t) in the past 24 hours which were eligible for micro-randomization

Table 5. Definition of outcome analysis population had participants always completed EMAs in person-blocks where they were eligible for micro-randomization

Hypothesis	**Outcome analysis population**	**Data used to estimate treatment effect had participants always completed EMAs in person-blocks where they were eligible for micro-randomization**
H1 *(main analysis)*	Person-blocks $t = 7,8,\ldots,54$ where $I_t = 1$	Participants: XX Micro-randomizations: XX
H1 *(sensitivity analysis)*	Person-blocks $t = 1,2,\ldots,60$ where $I_t = 1$	Participants: XX Micro-randomizations: XX
H2 *(main analysis)*	Person-blocks $t = 7,8,\ldots,54$ where $I_t = 1$	Participants: XX Micro-randomizations: XX
H2 *(sensitivity analysis)*	Person-blocks $t = 1,2,\ldots,60$ where $I_t = 1$	Participants: XX Micro-randomizations: XX
H3a & H3b *(when moderator is operationalized in terms of a baseline assessment)*	Person-blocks $t = 7,8,\ldots,54$ where $I_t = 1$	Participants: XX Micro-randomizations: XX
H3a & H3b *(when time-varying moderator is operationalized in terms of the person-block just prior to the current person-block)*	Person-blocks $t = 7,8,\ldots,54$ where $I_t = 1$ and $I_{t-1} = 1$ Note: Recall that by design, the smoking cessation app will only administer EMAs if micro-randomization occurred. Therefore, if the person-block just prior to the current person-block did not have any micro-randomization, we exclude the current person-block from these analyses.	Participants: XX Micro-randomizations: XX
H3a & H3b *(when the time-varying moderator is operationalized in terms of the past 24 hours from the current person-block)*	Person-blocks $t = 7,8,\ldots,54$ where $I_t = 1$ and $\sum_{j=1}^{n_t} I_{t-j} \geq 1$ Note: The outcome analysis population differs from that described in the preceding row since the outcome analysis population described in this row includes person blocks where $I_t = 1$ and $I_{t-1} = 0$ but $\sum_{j=1}^{n_t} I_{t-j} \geq 1$.	Participants: XX Micro-randomizations: XX
H4a & H4b *(when the proximal outcome is operationalized in terms of the current person-block)*	Person-blocks $t = 7,8,\ldots,54$ where $I_t = 1$	Participants: XX Micro-randomizations: XX
H4a & H4b *(when the proximal outcome is operationalized in terms of the next person-block)*	Person-blocks $t = 7,8,\ldots,54$ where $I_t = 1$ and $I_{t+1} = 1$ Note: Recall that by design, the smoking cessation app will only administer EMAs if micro-randomization occurred. Therefore, if the person-block right after the current person-block did not have any micro-randomization, we exclude the current person-block from these analyses.	Participants: XX Micro-randomizations: XX

Table 6. Actual definition of outcome analysis population used in complete case analysis

Hypothesis	Outcome analysis population	Data used to estimate treatment effect
H1 *(main analysis)*	Person-blocks $t = 7,8,\ldots,54$ where $I_t = 1$ and which had observed **Additional criteria:** Among person-blocks where $I_t = 1$, **the proximal outcome and all covariates included in the data analysis model must have no missing values.**	Participants: XX Micro-randomizations: XX
H1 *(sensitivity analysis)*	Person-blocks $t = 1,2,\ldots,60$ where $I_t = 1$ **Additional criteria:** Among person-blocks where $I_t = 1$, **the proximal outcome and all covariates included in the data analysis model must have no missing values.**	Participants: XX Micro-randomizations: XX
H2 *(main analysis)*	Person-blocks $t = 7,8,\ldots,54$ where $I_t = 1$ **Additional criteria:** Among person-blocks where $I_t = 1$, **the proximal outcome and all covariates included in the data analysis model must have no missing values.**	Participants: XX Micro-randomizations: XX
H2 *(sensitivity analysis)*	Person-blocks $t = 1,2,\ldots,60$ where $I_t = 1$ **Additional criteria:** Among person-blocks where $I_t = 1$, **the proximal outcome and all covariates included in the data analysis model must have no missing values.**	Participants: XX Micro-randomizations: XX
H3a & H3b *(when moderator is operationalized in terms of a baseline assessment)*	Person-blocks $t = 7,8,\ldots,54$ where $I_t = 1$ **Additional criteria:** Among person-blocks where $I_t = 1$, **the proximal outcome and all covariates included in the data analysis model must have no missing values.**	Participants: XX Micro-randomizations: XX
H3a & H3b *(when time-varying moderator is operationalized in terms of the person-block just prior to the current person-block)*	Person-blocks $t = 7,8,\ldots,54$ where $I_t = 1$ and $I_{t-1} = 1$ **Additional criteria:** Among person-blocks where $I_t = 1$, **the proximal outcome and all covariates included in the data analysis model must have no missing values.**	Participants: XX Micro-randomizations: XX
H3a & H3b *(when the time-varying moderator is operationalized in terms of the past 24 hours from the current person-block)*	Person-blocks $t = 7,8,\ldots,54$ where $I_t = 1$ and $\sum_{j=1}^{n_t} I_{t-j} \geq 1$ **Additional criteria:** Among person-blocks where $I_t = 1$, **the proximal outcome and all covariates included in the data analysis model must have no missing values.**	Participants: XX Micro-randomizations: XX
H4a & H4b *(when the proximal outcome is operationalized in terms of the current person-block)*	Person-blocks $t = 7,8,\ldots,54$ where $I_t = 1$ **Additional criteria:** Among person-blocks where $I_t = 1$, **the proximal outcome and all covariates included in the data analysis model must have no missing values.**	Participants: XX Micro-randomizations: XX
H4a & H4b *(when the proximal outcome is operationalized in terms of the next person-block)*	Person-blocks $t = 7,8,\ldots,54$ where $I_t = 1$ and $I_{t+1} = 1$ **Additional criteria:** Among person-blocks where $I_t = 1$, **the proximal outcome and all covariates included in the data analysis model must have no missing values.**	Participants: XX Micro-randomizations: XX

Note: For simplicity of presentation, we do not use partially completed EMA when reporting data used to estimate treatment effect. This is a more stringent criterion than what we actually used: even if an EMA were completed partway through (i.e., not fully completed), the person-block was not counted as having missing data as long as the specific EMA item relevant to carrying out the analysis was not missing.

6. References

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