

Does the Synchrony Effect modulate the emergency of the lateral mental timeline? (#173286)

Author(s)

This pre-registration is currently anonymous to enable blind peer-review.
It has 5 authors.

Pre-registered on: 05/01/2024 08:32 PM (PT)

1) Have any data been collected for this study already?

No, no data have been collected for this study yet.

2) What's the main question being asked or hypothesis being tested in this study?

This study hypothesizes that the spatiotemporal congruency effect in a time judgment task will be greater when the task is performed at a time of day that is congruent with the chronotype than when the session is incongruent with the chronotype.

3) Describe the key dependent variable(s) specifying how they will be measured.

- Reaction time from stimulus presentation to keypress response (in milliseconds).
- Accuracy, measured as the proportion of correct responses.

4) How many and which conditions will participants be assigned to?

Verb roots will be selected and randomly divided into two Sets. The verbs in the two sets will be equal in their overall frequency, length, and initial letter. Each participant will carry out the task twice: once at a time of day that is congruent with their chronotype and another at an incongruent time of day. The assignment of item Sets to the morning or evening session will be counterbalanced among participants. Set Assignment is the first counterbalance variable. Each verb root will generate a past-inflected verb and a future-inflected verb. Verb roots in each of the two Sets will be randomly assigned to two Lists. In List 1, the first half of roots will be inflected in the past and the second in the future (and the opposite in List 2). Lists will be counterbalanced over participants, so half the participants see the first list and half the second. The list is the second counterbalance variable.

Inflected verbs will be presented at the center of the screen. The participant will discriminate their temporal reference by means of a left or right keypress. In one block, the left key will be used to respond to "past" and the right key for "future" (this is the congruent mapping). In another block, the mapping will be reversed (incongruent mapping). Block Order (congruent first, congruent second) will be counterbalanced (third counterbalance variable).

We will manipulate within participants:

- 1- Space-Time Congruency: Congruent (left-past and right-future mappings) vs. Incongruent (left-future vs. right-past mappings).
- 2- Chronotype Congruence: Congruent (task session at the optimal time of the day depending on chronotype) vs. Incongruent (task session at the non-optimal time of the day).

We will manipulate between participants:

- 3- Counterbalance condition: defined by the interaction of Set Assignment x List x Block Order, for a total of 8 conditions for each run of the counterbalance.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.

Because this study's hypothesis tests two congruence effects (Time Congruence and Chronotype Congruence), we will include them as fixed factors and their interactions in a linear mixed model for latencies and a generalized linear mixed model using a logit link for accuracy measures. The finding of the most adequate random term of the models will start, including random intercepts and all possible random slopes allowed by the design. It will simplify the model until finding the simpler model that does not generate convergence or singular fit warnings and does not lose goodness of fit. Using that model we will also analyse design's sensitivity, its power for the established SESOI (10 ms) at the a priori power analyses, its power for the observed effect size, and its Type I error rate, using simulations with the R package simr.

We will use logarithmic transformations of latencies to get a normalized dataset. The congruence factors (Time Congruence and Chronotype Congruence) will be centered at -0.5 for the incongruent level and 0.5 for the congruent one. Alpha will be set at 0.05, and post-hoc comparisons will be corrected by Bonferroni.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.

Exclusion criteria for this study include having less than 18 or more than 40 years old, a deficit or pathology that affects semantic processing, spatial thinking, motor skills, or time experience (e.g., anxiety or depression). The gender of the participants will be as balanced as possible. Participants will be pre-screened by assessing their chronotype. Those participants with a score of morning chronotype above 60 and those with an evening chronotype below 40 will be selected to carry out the main experimental task. The Morning-Eveningness Questionnaire's Spanish version (Adan & Almirall, 1990) will be used. Participants who carry out the experimental task and have more than 20% errors will be excluded from further analysis.

Latency outliers will be defined as those latencies that differ more than +/-2.5 deviations from the grand mean and discarded.

7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.

We computed power based on latency data from prior studies of the authors, which we analyzed using a linear mixed model with random intercepts (no

random slopes) and Simulations using the simr package (Green & MacLeod, 2015, version 1.0.7.) - using R Studio version 3.6.3. (R Core Team, 2020). As the Type I error with this model was slightly above 5%, we used $\alpha = .046$. These simulations showed that 48 participants are sufficient to achieve greater than 80% power at the interaction between Space-time Congruency and Chronotype Congruency.

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)

Nothing.