# Overview of Changes in the Algorithm

**Introduction of New Features**

1. Ecological Momentary Assessment (EMA): A new feature introduced in the updated algorithm. The EMA is a brief survey that is triggered once every day. The timing of the EMA is determined by the response to a question from the previous day's Daily Questionnaire (DQ). If the participants indicate they plan to engage in physical activity, the EMA is triggered before the planned activity slot. If no activity is planned, the EMA is triggered at 12:00. This is done at the individual level, not the couple level.
2. After submitting an EMA, the system should check if it needs to trigger the Second Algorithm to select a situation at this moment or not.

Changes to "Determining the Situation"

1. In the pilot study, the appropriate slot (i.e., before planning, before activity, evening) was defined at the intervention level. Now, it is defined at the situation level. This means that we will have three lists of situations for each slot.
2. The selection and triggering process of interventions have been revised.

**2. Algorithm Adjustments**

1. First Algorithm:
   * The initial steps remain the same as in the pilot study. However, the formula for the "TotalScore" changes from 2x Severity + Frequency + TimeDelta to 3x Severity + Frequency + TimeDelta.
   * Instead of selecting the situation with the highest score after all TotalScores have been calculated (as was done in the pilot), all TotalScores are logged and the first algorithm ends. The second algorithm is then initiated for the "evening" slot.
2. Second Algorithm:
   * Previously, there were two versions: "before planning" and "before activity." Their sole purpose was to check if the situation was present and if a situation was in the slot. Now, they will actually select the situation and the intervention.
   * The second algorithm now aggregates the recent TotalScores from the first algorithm, but only for situations suitable for the current slot. It then uses the "SelectionScore" to calculate the FinalScore and selects the situation with the highest FinalScore.
   * Variations in the second algorithm are dependent on the slot type. The "evening" slot uses today's TotalScores as the SelectionScores, the "before planning" slot uses the previous day's TotalScores, and the "before activity" slot uses the EMA Score.

**Timing of Slots**

1. The "Evening" slot timing remains unchanged, with selection and triggering happening immediately after the first algorithm completes its calculations.
2. The "Before planning" slot is triggered as it was in the pilot study, every Sunday morning.
3. The "Before activity" slot's triggering is now based on a response to a question in the EMA, not on the plans made in the app.

**Intervention Selection**

1. Now, this occurs when a version of the second algorithm completes its process, instead of every evening as in the pilot study.
2. The process starts the same as in the pilot until an intervention is selected. Now, there is an additional step where it is randomly determined (with a 50% chance) whether the intervention is triggered. If not triggered, it is logged as selected and scheduled at this time but marked as not triggered.
3. The logic based on the slot of the intervention used in the pilot study is no longer applicable and will be skipped. Instead, the intervention is simply triggered immediately.

# Complete System Summary (new algorithm)

**Ecological Momentary Assessment (EMA) Triggering and Scoring**

The system should include a mechanism for triggering an Ecological Momentary Assessment (EMA). EMAs are brief surveys that ask individuals about their experiences, behaviors, and moods at the moment.

The triggering of an EMA should occur exactly **once** every day and can happen at different specific times throughout the day (5am, 11am, 12pm, 1pm, and 5pm).

The decision to trigger an EMA should be based on the individual's expected activity for the day, which can be retrieved from their last daily questionnaire. If no activity is planned, the EMA should be triggered during the lunch time slot (12pm). If an activity is planned for a specific time slot, the EMA should be triggered during that time slot.

In the EMA, the person will again specify whether and in which slot they expect to be active. When the EMA is submitted, the system should check if an expected activity is still upcoming for the day. If it is, the system should start the selection a situation for 'before\_activity' right away (see Algorithm 2).

**Algorithm 1: Calculate Situation Scores**

The system should include a mechanism for calculating situation scores. Like in the pilot study, the system can execute this algorithm every 5 minutes between 6pm and 5am for each couple. The calculation should only proceed if both partners have completed their diaries. If not, and it's past 4am, the system should wait until the next check. Otherwise, it should log all total scores as zero and trigger situations 0A, 0B, and 0C.

The total score for each situation should be calculated as a combination of (3x) severity score, frequency score, and time delta. These scores represent the severity of the situation, how often it occurs, and the time since it last occurred, respectively.

**Algorithm 2: Select Situations**

The system should include a mechanism for selecting situations. This should be done every Sunday at 4am for each couple (slot “before planning”), but it can also be triggered by an EMA (slot “before activity”) or Algorithm 1 (slot “evening”).

The system should select situations based on the aggregated score and the selection score. The final score for each situation should be calculated as a combination of these two scores (weighted geometric mean). The aggregated score is the mean of the last 14 total scores, and the selection score is the last total score from the daily questionnaire or today's EMA score, depending on the slot.

**Algorithm 3: Select Intervention**

The system should include a mechanism for selecting interventions. This should be triggered by Algorithm 2.

The system should select interventions based on their frequency and time delta. The total score for each intervention should be calculated as a combination of these two factors.

The selected intervention should be triggered with a 50% chance. The system should log the details of the intervention selection, including the current date and time, the selected situation, the selected intervention, and whether the intervention was triggered.