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Hackathons

Hackathon 1: A Network Analysis of the Belgian-Dutch ESM Expert Network

- Wolfgang Viechtbauer, Associate professor Maastricht University/Open University, wolfgang.viechtbauer@maastrichtuniversity.nl

The Belgian-Dutch Network for ESM Research in Mental Health (also known as the Belgian-Dutch ESM Expert Network) brings together researchers from multiple universities across Belgium and the Netherlands to advance the use of the experience sampling method in mental health research. Since its inception in 2016, the annual meeting has grown from a small gathering of a few dozen participants to a vibrant community of over one hundred researchers.

In this hackathon, we will map and analyze the structure of this growing scientific community. Participants at this year's meeting will be invited (prior to or during the meeting) to provide information on their collaborations, co-authorships, and professional connections within the network. Using these data, we will construct and visualize the network, and compute key network metrics to characterize its structure.

Together, we will explore burning research questions such as: Who has the highest betweenness or Eigenvector centrality within the network? How interconnected is the community? Are there identifiable clusters, subgroups, or structural gaps within the network? The hackathon will be hands-on and collaborative, with the goal of producing both insightful visualizations and a deeper understanding of the network's structure.

Hackathon 2: Defining and Assessing Positive Events in Daily Life

- Patrick Klaiber, Assistant professor Tilburg University (TESC), p.d.klaiber@tilburguniversity.edu

Positive events (sometimes called uplifts) are essential ingredients of everyday life. They provide people with positive emotions as they go about their day, and their absence has been identified as an important risk factor for depressive disorders. Despite their importance, the literature remains troubled by fundamental questions about how to define and assess them. Current approaches vary widely: some researchers rely on checklists of potential positive events, others leave it to respondents to decide whether a positive event has occurred and what constitutes one, and still others skip identification altogether and simply ask questions about the most positive experience of the day regardless of whether anything notable happened.

For this hackathon I would like to bring researchers together to tackle these definitional and measurement challenges. The goal is to discuss how positive events can be

meaningfully defined in the context of experience sampling, and to work toward concrete recommendations (or even a new measure) for assessing them in daily life. Through structured discussion and collaborative work, we aim to leave the session with shared conceptual ground and practical next steps the field can build on.

Anyone interested in better understanding the positive side of daily life, as well as those with expertise in ESM measurement more broadly are very welcome to join. No preparation is required: just curiosity and a willingness to dig into the messiness of measuring what makes a day a good one.

Hackathon 3: Co-creating a Participant Experience Evaluation Tool in ESM Cognition studies

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- Kamila Ignatowicz, PhD student Carl-von-Ossietzky Universität Oldenburg

ESM cognition studies can place substantial demands on participants, yet there is no standardized tool for evaluation of participant experience. Therefore, researchers from the Experience Sampling Methods - Cognition Connect Network (ESM-CCN) want to host a collaborative hackathon focusing on improving participant-centered research practices in ESM cognition studies. In the workshop, we will jointly design a framework for evaluating participant experience in ESM cognition studies, including, i.e. burden, usability, motivation, and engagement across study phases. The final outcome will be a standardized evaluation framework intended for subsequent validation by participant and patient groups.

Hackathon 4: Nature and Mental Health in Daily Life: Towards an ESM Item-Bank for Green Mental Health

- Jindra Bakker, Senior Researcher Maastricht University, Mondriaan jindra.bakker@maastrichtuniversity.nl
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A growing body of evidence supports the notion that green spaces play a crucial role in enhancing mental health. A meta-analysis by Zhang et al. (2024) concluded that access to green environments is linked to reduced risks of several common psychiatric disorders, including depression, anxiety, dementia, schizophrenia, and ADHD. This is further supported by South et al. (2019), whose randomized trial showed that greening vacant urban land led to a 41.5% decrease in feelings of depression and a 62.8%

reduction in self-reported poor mental health among community-dwelling adults. The benefits of nature extend beyond outdoor exposure: Chen et al. (2025) demonstrated that even virtual exposure to natural environments can effectively reduce anxiety, stress, and depressive symptoms, suggesting that the perception of nature is itself a therapeutically relevant factor. Notably, the positive impact of green environments has also been demonstrated within clinical settings: Ulrich et al. (2018) found that incorporating natural elements in psychiatric ward design was associated with reduced aggressive behavior among patients and fewer physical restraints.

Several theoretical frameworks help explain these effects. Markevych et al. (2017) identified three primary pathways through which greenspace influences health: reducing harm (e.g., decreasing exposure to pollution and noise), restoring capacities (e.g., attention restoration and physiological stress recovery), and building capacities (e.g., encouraging physical activity and social cohesion). At the individual level, Berman et al. (2012) found that walking in natural settings significantly improved both cognitive performance and mood in individuals diagnosed with major depressive disorder. Qualitative research adds a further dimension: Meuwese et al. (2021) showed that integrating nature into psychotherapy helps clients connect more deeply with their emotions, with participants reporting feelings of calmness and restoration that positively influenced their therapeutic experience.

ESM and related mobile methods have increasingly been used to study nature exposure and mental health in daily life, and two recent systematic reviews map the current state of this literature. Christensen et al. (2025) identified 33 geographically explicit EMA studies on place-based correlates of mental health and wellbeing, of which eleven focused on nature exposure, finding consistent associations with better mental health and higher wellbeing across methodologies. Deng et al. (2025) similarly synthesised 33 mobile methods studies on greenspace exposure and affective states, but highlight that inconsistent definitions of both nature exposure and affective outcomes, alongside methodological variation, pose significant challenges to building a coherent evidence base, calling for greater standardisation. Together, these reviews underscore both the promise and the current limitations of ESM-based nature research: while the direction of effects is consistent, the field lacks the shared instrumentation needed to accumulate comparable evidence. Providing a standardised item-bank for momentary nature exposure would be a direct response to this gap.

During this hackathon, we aim to develop a first version of such an item-bank, grounded in the green mental health literature. The goal is to construct a set of validated, theoretically informed items that can be flexibly embedded in ESM studies with both general and clinical populations, enabling researchers and clinicians to systematically investigate the role of nature in mental health and recovery in daily life.

Hackathon 5: Evaluating ESM Item Quality and Usefulness: How do we Balance the Input From Users and Researchers When Personalising Assessment

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- Melissa de Smet, Assistant Professor KU Leuven, melissa.desmet@kuleuven.be

Background

In a recent collaboration, expert ESM researchers have come together to form the ESM-Q, a quality assessment tool for ESM items. The ESM-Q is a set of criteria which describe what a good quality ESM item constitutes of. These criteria however are based on the researchers' input, and might therefore miss out on the opinions that are specific and noticeable to the participants themselves. Therefore, we previously conducted a study to get an indication of how the ESM users themselves evaluate the quality of ESM items, and whether this aligns with the researchers' recommendations. Initial findings indicate that there certainly are similar opinions on item quality between the researchers and users (i.e., the things participants notice and mention align with some of the stated criteria). Yet, the ESM users have also commented on many aspects that are not mentioned in the ESM-Q. In fact, some of the users' comments and evaluations seem to contradict the ESM-Q's suggestions.

This raises some interesting questions that go beyond only the ESM-Q guidelines, and relate to personalisation practices in ESM. Namely, how do researchers who aim to personalise or co-create their ESM designs realistically adjust their designs to the participants' evaluations and preferences? And how do you handle disagreements between participants' wishes and researchers' wishes/requirements?

In this hackathon, we will attempt to answer these questions together through discussion, and by examining some cases from our conducted study. This hackathon is particularly relevant for audiences that wish to personalise or co-create ESM assessment with their participants.

Aims

The aim of this hackathon is twofold: to work through (shortened) cases of participants and get some hands-on experience with such interview data; and to get your expert input and discuss potential solutions to two main questions:

- 1) How would you incorporate users' input into your ESM design?

- 2) How can we manage conflicts in ESM design preferences between the researchers and the users?

Additionally, I would very much like to continue this project after the hackathon by considering your input as participant data for a research paper. You are free to choose whether you want to contribute to this (either through providing your data, or through further collaboration)!

Intended product of the hackathon

- Memos of how the researchers partaking in the hackathon have adapted to (or wish to adapt to) personalisation preferences of ESM users. These memos will result from their lived experience as researcher, but also from their responses to the in-person exercise.
- Discussion notes and a list of innovative solutions and strategies to personalise ESM assessment and balance users' feedback with researchers' requirements.
- Hopefully, a research paper which will be worked on after the hackathon still. The participants of the hackathon can choose whether they want to contribute to this by providing their personal hackathon input as participant data. If desired by the hackathon participants, we could potentially also collaborate on the paper together.

Workshops

Workshop 1: So you collected open ended ESM data - what now?

- Leonie Schorrlepp, PhD-Student Tilburg University, l.schorrlepp@tilburguniversity.edu
- Marie Stadel, Assistant Professor Tilburg University, m.stadel@tilburguniversity.edu
- Yong Zhang, PhD-Student University of Groningen, yong.zhang@rug.nl

Often, we include open-ended items in our ESM questionnaires – to get more detailed descriptions of context, events, thoughts, etc., or to simply to give space to participants for extra comments. Rarely, however, do responses to these items get formally analysed (Bringmann et al., 2026), which is a pity given the wealth of information that open ended items might yield. The systematic analysis of open-ended ESM responses can inform about participants' reasons for their ratings (Dewitt et al., 2025), be used to inform validity judgements about inference from numerical items (Schorrlepp et al., 2025) and open up elaborate insight into phenomena of interest. But where to start with harnessing the power of open-ended items?

In this workshop, we will start answering this question with a strong practical focus. Participants will be introduced to the analysis of open-ended ESM responses, concentrating on qualitative methods and how these differ from other techniques such as natural language processing (NLP). We will cover how to formulate a qualitative research question, choose a fitting analytical approach and practice some initial coding with an [open access shiny app](#). Finally, the workshop will include reflections on the researcher's role in the analysis and what constitutes quality and rigor in qualitative research. This is an interactive workshop, and attendants are warmly invited to bring their own data from open ended ESM items to get started on analysing them. Secondary data from our projects will also be available for practice. Our main aim is to get attendants equipped with basic tools and knowledge to start meaningfully using open-ended ESM items to answer research questions about daily life phenomena and processes.

Max participants = 20

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Workshop 2: Real-time monitoring of psychological change: Using statistical process control procedures with experience sampling data

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- Evelien Schat, Postdoctoral Researcher KU Leuven–University of Leuven, evelien.schat@kuleuven.be
- Marieke Schreuder, Postdoctoral Researcher KU Leuven – University of Leuven, marieke.schreuder@kuleuven.be

Experience Sampling Methods (ESM) enable the investigation of momentary experiences, including emotions, cognitions, and behaviors. Technological advances have made it possible to collect intensive longitudinal data over extended periods of time, allowing researchers to investigate changes in both level and variability that are essential for understanding and predicting transitions in mental health. However, detecting these transitions requires analytical tools capable of identifying meaningful change at the individual level and in real time, thereby enabling timely intervention.

Statistical Process Control (SPC) offers a promising framework for addressing this challenge, as it allows for the real-time monitoring of within-person dynamics in ESM data, with the goal of detecting meaningful changes in both mean level and variability. Within this framework, control limits are first constructed based on person-specific data collected during an in-control (calibration) period, reflecting a stable or healthy state. Monitoring then proceeds in real time, with incoming ESM data compared against these limits; observations exceeding a control limit may signal impending changes in mental health. In recent empirical applications, SPC has been applied to anticipate the onset and recurrence of mental disorders and to guide adaptive treatments.

In other words, SPC procedures can help to infer whether a specific person, at a specific moment in time, reports emotions, cognitions, or behaviors that deviate from what is normal for that individual during healthy periods, thereby supporting the planning of preventive interventions and adaptive treatments.

In this workshop, we aim to demonstrate the fundamentals of SPC and its application using simulated data in two contexts: (1) assessing the detection of momentary risk for mental disorders, and (2) evaluating changes during psychological treatment.

By the end of the workshop, participants are expected to have learned:

- The fundamentals of SPC procedures (i.e., assumptions, calibration and monitoring phases, control limits)
- The differences between SPC procedures (e.g., Shewhart, EWMA) and the types of applications for which each procedure is most suitable
- How to implement SPC procedures and construct control limits using ESM data
- Strengths, challenges, and practical considerations for implementing SPC procedures

The workshop will include practical exercises in R; we recommend that participants bring their laptops with R and RStudio installed.

Workshop 3: Event-based sampling of social interactions: How to not re-invent the wheel

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- ,Minita Franzen, assistant professor Erasmus University Rotterdam, franzen@essb.eur.nl

BACKGROUND: Experience sampling is most often signal-based, and has been used to obtain intensive-repeated measures of social contact (e.g., were participants in the company of other people during the preceding interval) or social context (e.g., how was this company experienced) and how these relate to within-person fluctuations in affect. However, signal-based sampling does not fit every research question. For researchers interested in studying social interactions, an event-based approach is often more suitable: participants record how they behaved, felt, and perceived their interaction partner(s) right after an interaction ends, capturing the event before the next interaction happens, which prevents bias. In this workshop, we introduce an established event-based sampling approach designed specifically for the study of social interactions. It comes with well-validated questionnaire items, has proven flexible enough to accommodate new research questions, has been applied across a range of (clinical) psychological contexts. We also offer hands-on experience with using this approach in m-Path.

AIMS: 1) To describe the history of experience sampling of social interactions; 2) To showcase various applications relevant to (clinical) psychological science; 3) To provide psychometric evidence for an established event-based approach; 4) To support researchers interested in designing a study using this approach; 5) To show how the method can be implemented and used within m-Path

Requirements: laptop and smartphone with m-Path installed.

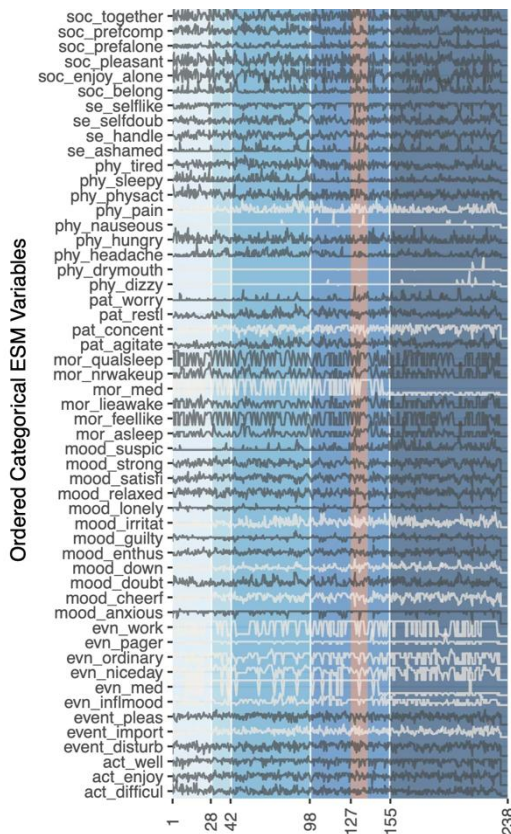
Workshop 4: Detecting recurring states in multivariate ESM data - An idiographic, descriptive analysis of internal state dynamics using recurrence networks.

- Fred Hasselman, Associate professor Radboud University Nijmegen (REMAC), fred.hasselmann@ru.nl

Intensive longitudinal measurement of human physiological, psychological and emotional states often yields multivariate time series data of more-or-less simultaneously observed values. Arguably the most popular method for statistical analysis of such multivariate data is Vector Autoregression (VAR) or one of its many variants, which allows for the simultaneous estimation of autoregressive parameters. There are however a number of limitations to VAR and related techniques such as modelling nonstationarity, nonlinearity and multiple time scales (Bringmann et al., 2018; Cui et al., 2026).

Recurrence based analyses of multivariate time series data offer a descriptive method which was developed to quantify the observed dynamics by examining the data for repeating occurrences (recurrences) of specific values or sequences of values.

Specifically, the so-called recurrence network framework provides a versatile



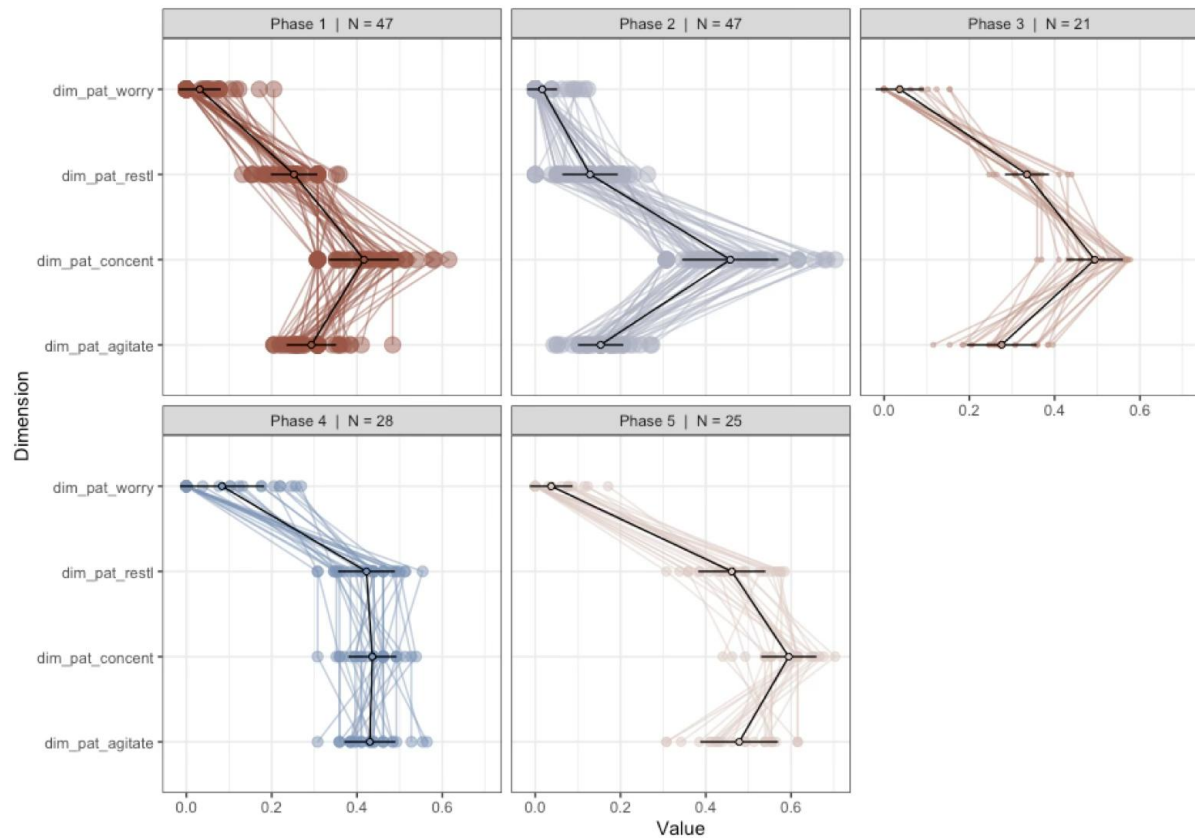
representation of multivariate dynamics (Eroglu et al., 2018; Hasselman & Bosman, 2020). The main idea is to consider simultaneously observed tuples of ESM/EMA variables as a coordinate in a multidimensional state space, for example, of an ESM study measured the experience of 4 different emotions 10 times a day for a period of 2 weeks, there would be 140 coordinates that represent different states in the 4-dimensional emotion space, the multivariate time series represents a trajectory through this state space.

The Figure on the left is a representation of a vast multivariate time series observed in a single case from a well-known study on predicting a critical transitions (Wichers et al., 2016). There were 4 questions related to mental unrest of the patient (preceded by “pat_”). We can ask whether the internal

states related to mental unrest showed any periodicity or recurrence, or perhaps they were very random and not persistent at all.

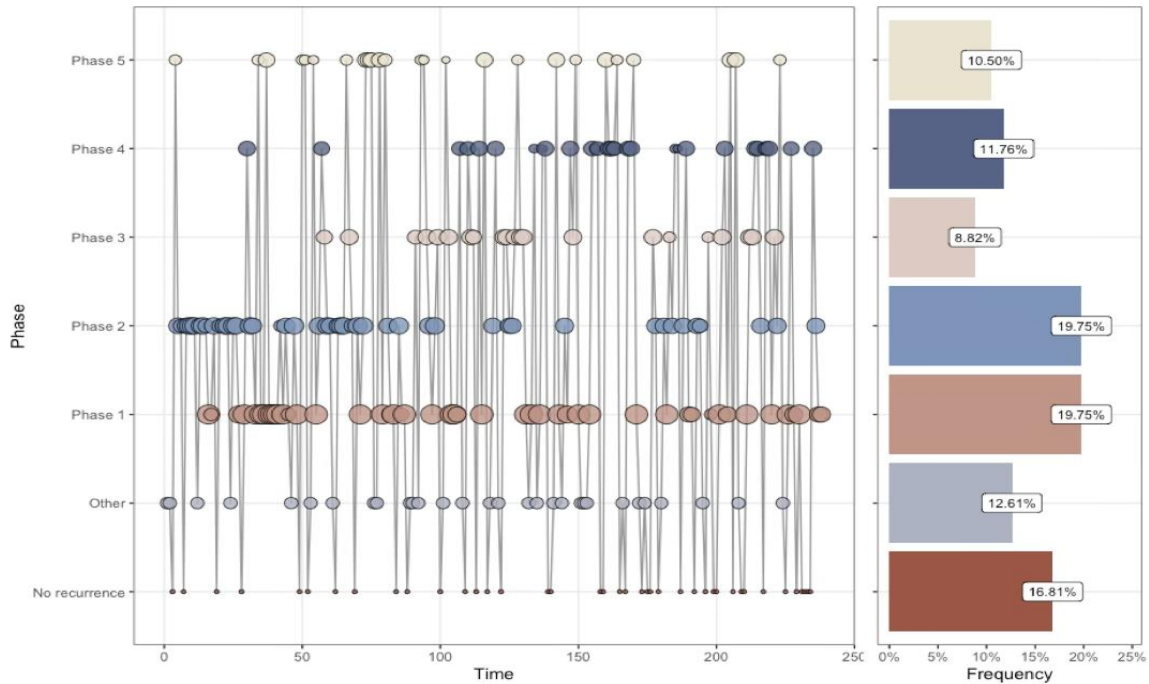
To do so we calculate a distance matrix and determine for each observed combination of 4 values related to unrest (*worrying, restlessness, concentration problems and feeling agitated*) whether it will approximately recur at a future point in the time series.

Based on this information we can extract the approximately recurring states, or *phase profiles* based on the 4 variables, as is shown in the figure below.

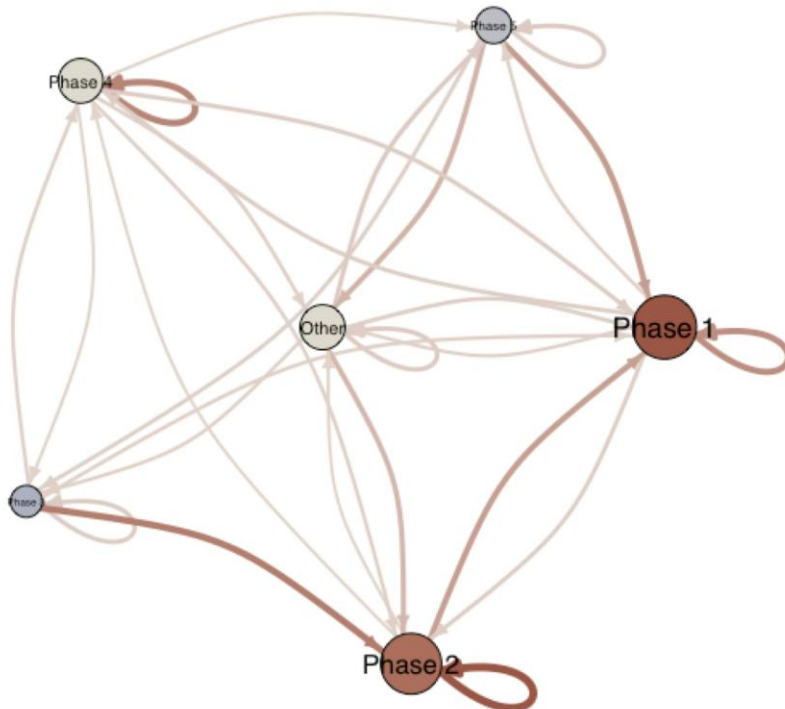


Here we can see there were 5 distinct phases, of which 3, 4 and 5 can be characterized as overall increased levels of *restlessness*, problems *concentrating* and *agitation*, while *worrying* remains quite low over the entire observational period.

We can also plot these phases again as a nominal time series, in which we see the phase characterized mostly by problems with concentration (phase 2) appears to occur more often in the beginning of the observation period, whereas phase 4 emerges more near the end of the observational period.



Based on frequency of occurrence it is possible to create a transition matrix and network from which one could derive what the most likely transition will be given the current phase. In the figure below it is clear that once phase 4 presents itself it is very likely that next time step it will be phase 4 again.



This method has been applied in various recent studies ranging from clinical case descriptions to studies on motivation for becoming more physically active to recovery from injury in professional athletes. The analysis is not limited to questionnaire data, but can also be used on unordered categorical data and continuous physiological data, for example to study physiological synchronisation (Hasselmann et al., 2023).

A great benefit over other analysis methods is that there is no need to worry about statistical assumptions, the only assumption is that the simultaneously observed values can be considered a coordinate in a state space (i.e. that we can calculate a distance measure). Also, all time scales are used to detect recurring patterns, not just a linear association at lag = 1 as is common in VAR. Moreover, this analysis can easily be used in a clinical setting in which patient data might be coming in at a daily basis. The graphs can be generated based on as few as 10 datapoint and can be updated as data is collected.

From these examples it is clear the analysis provides “descriptives” that have to be interpreted. What the extracted phases might represent is not given by the analysis. This depends entirely on the context in which the values were observed. During the workshop some qualitative methods will be discussed that can be used to try to label the extracted phases. During the workshop I will show it is not complicated to run these analyses and create these graphs using R (package *casnet*, <https://fredhasselmann.com/casnet/>). Just bring a laptop with the latest version of R and RStudio on which you can install packages. If you have a data set in which rows represent time and columns represent simultaneously observed variables that can be split by participant, it is possible to run these analyses. Of course, many extensions exist, such as multiplex-recurrence networks and time-varying analyses, these will be briefly discussed during the workshop.

Experience using R is highly recommended.

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Paper-in-a-Day sessions

Paper-in-a-Day 1: Socioeconomic Inequality in Positive Affect Reactivity

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Research on resilience in daily life has predominantly focused on how individuals respond to stress and adversity. Experience sampling research has shown that negative daily-life events are followed by changes in positive and negative affect, and that the magnitude of these responses may reflect meaningful individual differences in emotional vulnerability and resilience. At the same time, positive daily-life events also shape affective functioning, yet they are rarely integrated into resilience frameworks as events with their own dynamic consequences. Much less is known about whether socioeconomic context shapes both sides of this process: affective responses to negative events and affective responses to positive events in everyday life.

In this Paper-in-a-Day, we aim to bring together researchers with EMA/ESM datasets to conduct a coordinated mega-analysis on socioeconomic inequality in affect reactivity. Specifically, we will examine whether socioeconomic indicators, such as parental education, income, subjective SES, financial strain, or neighbourhood disadvantage, moderate within-person changes in positive and negative affect following daily negative and positive events. This allows us to ask whether socioeconomic inequality is reflected not only in average levels of wellbeing or stress exposure, but also in the moment-to-moment affective dynamics through which people recover from adversity and benefit from positive experiences.

We are especially looking for co-authors who can contribute EMA/ESM datasets including affect and daily events, expertise in multilevel or intensive longitudinal analyses, expertise in resilience, social inequality, reward processing, or youth mental health, and/or experience with open science, harmonization, or coordinated analyses.

The goal is to develop a theoretically informed and empirically grounded paper that advances resilience research beyond static individual-difference models by examining how socioeconomic context shapes affective reactivity to both negative and positive events in daily life. This dual-valence approach aligns with emerging perspectives on resilience as a dynamic process involving not only “bouncing back” from stress, but also capitalizing on positive experiences.

Requirements: laptop with access to R/RStudio

Maximum additional co-authors: 15

Preparation:

In September 2026, participating co-authors will be invited to join several online

preparation meetings in which we will define the core constructs, harmonize variables across datasets, and finalize the analysis plan and authorship agreements. Co-authors can expect access to a shared OSF project and collaborative workspace, a draft introduction and theoretical framework, a preregistration and analysis plan, harmonization guidelines for EMA/ESM variables, R scripts/templates for data preparation and multilevel analyses, and a codebook specifying the minimum required variables. Researchers are encouraged to prepare access to an EMA/ESM dataset containing affect measures and daily events, relevant socioeconomic indicators such as education, income, subjective SES, or financial stress, brief dataset documentation/codebooks, and information on ethical approval for secondary analyses and collaboration. The Paper-in-a-Day session itself will focus on final harmonization decisions, running coordinated analyses, interpreting results, and collaboratively drafting the manuscript.

Paper-in-a-Day 2: Stable Enough to Trust, Sensitive Enough to Change: Psychometrics of Cognitive Experience Sampling Tasks

- Nicola Ballhausen, Associate professor Tilburg University (TESC), n.m.ballhausen@tilburguniversity.edu
- Flavia Cherecheș, Tilburg University (TESC), co-host, F.S.Chereches@tilburguniversity.edu
- Laura Huiberts, Open University, co-host, laura.huiberts@ou.nl

Cognitive tasks are increasingly integrated into the Experience Sampling Methodology (ESM) to assess cognitive functioning in daily life. Unlike laboratory assessments, cognitive ESM tasks are designed to capture momentary fluctuations driven by contextual factors such as stress, fatigue, and environmental demands, while also reflecting stable individual differences. This creates a key psychometric challenge: tasks must be reliable and valid while remaining sensitive to meaningful within-person change. In this paper-in-a-day session, we want to provide an overview of how the validity of cognitive ESM tasks can be evaluated, including their relationship to traditional laboratory tasks and their construct specificity. We aim to discuss appropriate approaches of assessing the balance between stability and fluctuation, with the goal of advancing psychometric standards for cognitive ESM research.

For this PiaD, we hope to bring together complementary expertise from across our multidisciplinary network. We welcome contributors working in cognition, emotion, psychometrics, and related fields. In particular, if you have expertise in ESM psychometrics from areas such as emotion, personality, or other domains—even if you are not (yet) working on cognitive ESM—you are warmly invited to participate. By

combining perspectives across disciplines, we aim to produce a paper that strengthens the psychometric foundations of cognitive ESM research.

Preparation: In September, co-authors will be asked for their expertise and tasks will be allocated to prepare their contributions for the Paper-in-a-Day.

Maximum additional co-authors: 7