Symposium | Online and Mobile Environments

Sun. Oct 19, 2025 9:00 AM - 10:30 AM JST | Sun. Oct 19, 2025 12:00 AM - 1:30 AM UTC Venue 3(KOMCEE W Lecture Hall)

[S7] Symposium 7: Beyond the Lab: Timing Perception and Cognition in Online and Mobile Environments

Chair:David Melcher(New York University Abu Dhabi)

The ability of the brain to represent, integrate, and segregate events over time lies at the core of human cognition and behaviour. From low-level sensory processing to high-level cognitive functions, temporal processing shapes how we perceive the world, allocate attention, and make decisions.
Traditionally, research on temporal processing has relied on highly controlled laboratory settings. These environments enable millisecond-level precision for stimulus presentation and response recording, providing powerful tools to uncover the temporal structure of perception. However, lab-based experiments have notable limitations: they often rely on narrow participant pools, limiting generalizability and statistical power, and they require significant resources, physical space, and specialized equipment.
While laboratories remain the gold standard in timing research, these constraints highlight the growing appeal of web-based experimentation (Bridges et al. 2020). Recent advances in online platforms have improved the precision and reliability of behavioural and psychophysical tasks conducted remotely, creating new opportunities for high-quality timing research outside the lab. Similarly, the widespread use of smartphones and tablets has enabled novel methods to study temporal dynamics in ecologically valid, real-world contexts (Marsicano et al. 2022; 2024). Both web-based and mobile approaches, though offering reduced experimental control, allow for scalable data collection across diverse populations and can track within-subject variability across time and settings.
This symposium presents recent empirical evidence on the potential and limitations of web- and smartphone-based experimentation for investigating temporal perception and cognition. We highlight studies showing that, with appropriate tools and procedures, online platforms can achieve high levels of temporal precision comparable to traditional lab settings. These include web-based experiments on temporal integration and segregation across uni- and multisensory modalities and responses to rhythmic sensory stimulation (Marsicano et al., 2022; 2024; Deodato et al., 2024; Lamprou-Kokolaki et al., 2024). We also emphasize the benefits of accessing large, heterogeneous samples online, which supports the identification of individual differences and distinct temporal processing profiles. In addition, we introduce a smartphone-based approach for estimating individual alpha oscillation frequency via a visual illusion (Xu et al., 2025). This method uses perceived jitter to infer temporal characteristics of neural activity, capturing individual variability, mood-related changes, and diurnal patterns under naturalistic conditions. Across the symposium, we compare behavioural patterns and performance metrics across web, mobile, and lab contexts, showing broadly comparable data quality and variability. We also address key methodological challenges, such as device heterogeneity, participant attention, and timing uncertainty, and propose strategies to improve reproducibility, including calibration routines, browser-based latency checks, and frame-locked stimulus presentation. We review commonly used platforms (e.g., PsychoPy/PsychoJS, jsPsych) and evaluate the strengths of mobile tools for timing research. By integrating this diverse body of evidence, the symposium highlights how web and mobile technologies are expanding the reach of timing research, offering scalable, inclusive, and ecologically valid approaches to investigating the temporal dynamics of cognition.

9:00 AM - 9:15 AM JST | 12:00 AM - 12:15 AM UTC

[S7-01]

Beyond the Lab: Timing Perception and Cognition in Online and Mobile Environments

*David Melcher[1] (1. New York University Abu Dhabi (United Arab Emirates))

9:15 AM - 9:30 AM JST | 12:15 AM - 12:30 AM UTC

[S7-02]

Synchronizing Perception Online: Temporal Binding, Attention, and Individual Differences

*Gianluca Marsican, David Melcher (New York University Abu Dhabi (United Arab Emirates))

9:30 AM - 9:45 AM JST | 12:30 AM - 12:45 AM UTC

[S7-03]

Temporal Perception and Anomalous Visual Experiences: Insights from Large-Scale Web-Based Psychophysics

*Michele Deodato, David Melcher (New York University Abu Dhabi (United Arab Emirates))

9:45 AM - 10:00 AM JST | 12:45 AM - 1:00 AM UTC

[S7-04]

Compressed experimentation: duration, passage of time, and the temporal structure of memory

*Marianna Lamprou Kokolaki[1], Virginie van Wassenhove[1] (1. CEA/DRF/Inst. Joliot, NeuroSpin; INSERM, Cognitive Neuroimaging Unit; Université Paris Saclay (France))

10:00 AM - 10:15 AM JST | 1:00 AM - 1:15 AM UTC

[S7-05]

Inferring alpha oscillations from visual illusion: A smartphone-based method

*Kaoru Amano[1] (1. The University of Tokyo (Japan))

Beyond the Lab: Timing Perception and Cognition in Online and Mobile Environments

*David Melcher[1]

1. New York University Abu Dhabi

The ability of the brain to represent, integrate, and segregate events over time lies at the core of human cognition and behaviour. From low-level sensory processing to high-level cognitive functions, temporal processing shapes how we perceive the world, allocate attention, and make decisions. Traditionally, research on temporal processing has relied on highly controlled laboratory settings.
These environments enable millisecond-level precision for stimulus presentation and response recording, providing powerful tools to uncover the temporal structure of perception. However, lab-based experiments have notable limitations: they often rely on narrow participant pools, limiting generalizability and statistical power, and they require significant resources, physical space, and specialized equipment. While laboratories remain the gold standard in timing research, these constraints highlight the growing appeal of web-based experimentation (Bridges et al. 2020). Recent advances in online platforms have improved the precision and reliability of behavioural and psychophysical tasks conducted remotely, creating new opportunities for high-quality timing research outside the lab.
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Keywords: Temporal Processing, Web-Based Research, Sensory Integration, Entrainment, Individual Differences

Synchronizing Perception Online: Temporal Binding, Attention, and Individual Differences

*David Melcher[1]

1. New York University Abu Dhabi

Temporal processing is fundamental to perception, attention, and decision-making, yet investigating its mechanisms at scale remains a challenge (Bridges et al., 2020). This talk presents a series of web-based sensory integration tasks, from low-level audiovisual simultaneity judgments to perceptual decisions such as visual causality. Results demonstrate that, under carefully controlled conditions, online methods can yield data quality and temporal precision comparable to laboratory settings. Critically, the large and diverse samples enabled by online research allowed for the identification of distinct profiles of audiovisual temporal integration and segregation, linked to individual differences in autistic and schizotypal traits (Marsicano et al., 2022). Moreover, rhythmic sensory stimulation delivered online effectivelymodulated temporal processing and visuo-spatial attention across varied personological profiles. These findings underscore the promise of online experimentation not only as a method for investigating temporal cognition, but also as a scalable tool for modulating it through targeted manipulations (Marsicano et al., 2024).

Keywords: Web-Based Research, Temporal Processing

Temporal Perception and Anomalous Visual Experiences: Insights from Large-Scale Web-Based Psychophysics

*Michele Deodato[1]

1. New York University Abu Dhabi

Perceiving the timing and sequence of events is a fundamental component of human cognition. Disruptions in this temporal processing can cascade into broader cognitive deficits and have been implicated in several neuropsychiatric conditions, including schizophrenia.
With the increasing need for scalable and accessible cognitive assessment tools, online experiments are emerging as a powerful approach for investigating perceptual and cognitive functions in diverse populations. We demonstrate the feasibility of conducting web-based psychophysical experiments using precisely timed visual stimuli. Using the two-flash fusion task, we collected large-scale data alongside self-report questionnaires. Our findings replicate the well-established decline in visual temporal acuity with ageing. Strikingly, we also observe that individuals who report more frequent anomalous perceptual experiences and higher levels of schizotypal traits tend to exhibit better visual temporal acuity. These results challenge conventional assumptions and open new avenues for understanding the relationship between temporal perception and atypical cognitive experiences. Overall, the findings highlight the promise of web-based psychophysics as a valid and scalable method for studying individual differences in perception and cognition across broad populations.

Keywords: Large-Scale Web- Based Psychophysics

Compressed experimentation: duration, passage of time, and the temporal structure of memory

*Marianna Lamprou Kokolaki[1], Virginie van Wassenhove[1]

1. CEA/DRF/Inst. Joliot, NeuroSpin; INSERM, Cognitive Neuroimaging Unit; Université Paris Saclay

We live in a rich, dynamic, and multisensory world that our brain segments into narratives yet time studies in lab settings provide impoverished (though well-controlled) environments.

Online experiments can be one step towards real-world settings by enabling comparative studies of temporal experiences (e.g. duration, passage-of-time, segmentation) using rich stimuli (e.g. virtual-environment) while testing a large and diverse pool of participants quickly. For instance, using novel duration and speed-of-time bisection tasks at realistic time scales, we showed that event density shapes temporal judgments (Lamprou-Kokolaki et al., 2023). Using a series of online experiments, we found that sequence chunking influences temporal distances in memory with a surprising observation: memorability changes create implicit boundaries that affect temporal distances (Lamprou-Kokolaki et al., in prep.). Thus, online experimentation can foster new approaches to more classical paradigms, providing robust results and serving as a powerful tool for conducting short, efficient, yet rich experimental studies.

Keywords: duration, passage of time

Inferring alpha oscillations from visual illusion: A smartphone-based method

*Kaoru Amano[1]

1. The University of Tokyo

We previously demonstrated that the perceived frequency of the illusory jitter reflects (1) individual differences, (2) spontaneous intra-individual fluctuations, and (3) modulation via transcranial alternating current stimulation (tACS), all in the frequency of alpha oscillations (Minami & Amano, 2017). Building on these findings, we have developed a smartphone-based technology that estimates individual alpha frequency by measuring perceived jitter frequency, and are now working toward real-world implementation. In this presentation, we first revisit the relationship between illusory jitter and alpha oscillations. We then report new findings from smartphone-based psychological experiments examining alpha frequency under naturalistic conditions. Specifically, we present data showing shifts in alpha frequency associated with mood changes before and after yoga practice. Additionally, we describe diurnal variations in alpha frequency captured by the app, partially validated against chronicelectrocorticography (ECoG) recordings. These results highlight the potential of perception-based methods for scalable, non-invasive monitoring of neural oscillations in daily life.

Keywords: alpha frequency