


## Introduction

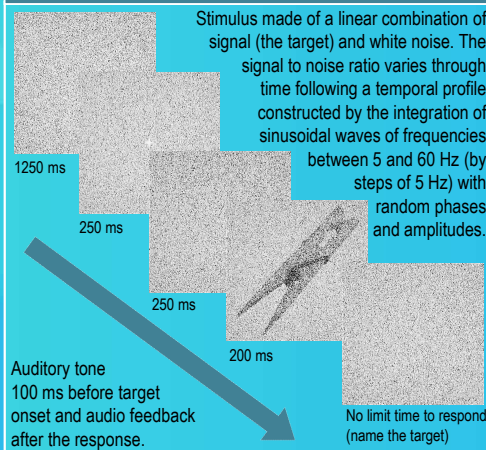
Several studies have shown temporal variations in visual processing capacity in humans. Using the method of temporal sampling, studies carried out in our laboratory on the recognition of faces (Blais, Arguin & Gosselin, 2013), words (Achouline et al., 2019; Arguin, 2018; Fortier-St-Pierre & Arguin, 2019) and unfamiliar objects (Arguin & Massé, 2019) suggest that, within the initial 200 ms of target display, encoding effectiveness varies substantially following a pattern that is unique according to stimulus class. Moreover, the results show patterns in the progression of temporal frequencies through time of the signal-to-noise ratio of the stimulus that are particularly favorable to efficient target processing and which also vary according to stimulus class.

The present study aims to determine the temporal features of processing effectiveness in a familiar object identification task.

## Methods

<b>Participants</b>	12 young adults (7 women) aged from 19 to 35 years old
<b>Stimuli</b>	330 familiar object images from the "Bank of Standardized Stimuli" (Brodeur and al., 2012) 
<b>Material</b>	Screen ASUSV248QR with a 120 Hz refresh rate Program written in MatLab with "Psychophysics Toolbox" extensions (Kleiner and al., 2007)
<b>Procedure</b>	2 sessions of 1h10 each / 1 practice bloc (30 trials) + 4 experimental blocs (1200 trials)

## Experimental task



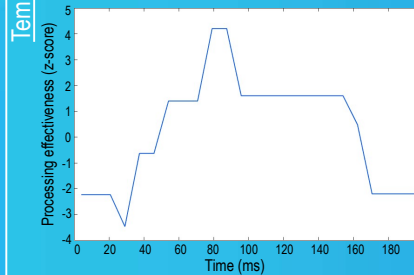
## Data analysis

For each participant, a classification image was constructed by subtracting the weighted sum of temporal sampling profiles (or of the outcome of their time-frequency analysis or of the phase x amplitude values from which they were made) associated with errors from that associated with correct responses. These were z-scored prior to averaging. Mean classification images were then smoothed and the Pixel test (Chauvin et al., 2005) was used to determine the statistical significance of z-score differences. All distinct consecutive values in the classification images illustrated below are significantly different from one another ( $p < .05$ ).

## Results

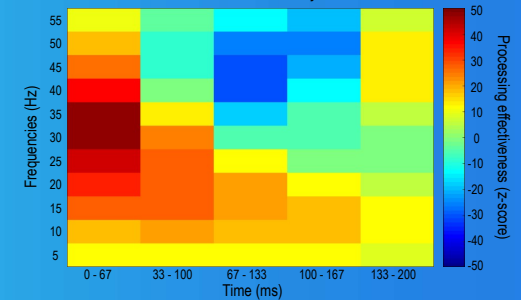
**Phase-Amplitude domain:** The classification image obtained from data analysis was perfectly uniform, thus indicating that no Phase x Amplitude feature impacted performance.

**Temporal domain:** Processing effectiveness is lowest at target onset, then rises to a peak at 79-88 ms to then gradually decline to about its initial level until 200 ms. There is a large between subject variability (mean of inter-subject correlations = 0.0087).



Time-frequency domain

The highest effectiveness peak is in the 0-67 ms time window for 25-35 Hz stimulus oscillations. This peak then declines trough time and shifts towards lower frequencies. The lowest effectiveness is in the 35-55 Hz range between 67 and 167 ms, while some of these frequencies (40-50 Hz) show a high effectiveness at 133-200 ms. Mean of inter-subject correlations = 0.9274.



## Discussion

The present results indicate rapid variations of visual encoding effectiveness in the initial 200 ms of stimulus exposure and suggest that the time-frequency classification images tap a highly fundamental aspect of visual processing given its remarkable stability trough participants. The uniform Phase x Amplitude classification image suggests that this code is inappropriate to capture how visual processing effectiveness unfolds through time. The temporal patterns demonstrated may originate from the particular set of cerebral oscillators that underly task performance.

## References

Achouline, Fortier-St-Pierre & Arguin (2019). The spatiotemporal dynamic of attention in normal reading. • Arguin (2018). The temporal profile of visual encoding. • Arguin & Massé (2019). The time course of novel visual object recognition. • Blais, C., Arguin, M., & Gosselin, F. (2013). Human visual processing oscillates: Evidence from a classification image technique. • Chauvin, A., Worstley, K. J., Schyns, P. G., Arguin, M., & Gosselin, F. (2005). Accurate statistical tests for smooth classification images. • Fortier-St-Pierre & Arguin (2019). The spatiotemporal deployment of processing resources in developmental dyslexia.

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