

The effect of previously subthreshold exposures on the perception of a period of time

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The perceived duration of events is known to be affected by factors that are at least partly conscious. In the present study we report that the perceived duration of visual events can be affected even by an unconscious factor. The participants were briefly (12.5 ms) exposed to nonsense syllables which were followed by backward pattern masking. A discrimination test for other participants confirmed that the stimuli were presented below a threshold level. The participants subsequently estimated the duration of the presentation of each of the nonsense syllables that either had, or had not, been previously exposed. The results indicated that the mean estimated duration of the stimuli that were previously exposed was less than that for the new stimuli. These results suggest that unconscious experience is one of determinants that can reduce the perceived duration of events.

Key words: time perception, subthreshold exposure

It has been shown that the perceived duration of events can be increased or decreased by several factors which Matsuda (1996) has classified into three categories. The first is cognition of the non-temporal attributes of events: the perceived duration increases when we recognize the stimuli as more numerous, intensive, complex and/or large. The second is the level of attention to the passing of time: the perceived duration increases when we attend more to the time which has elapsed. The third is neurophysiological excitement: the perceived duration increases when we are more excited neurophysiologically.

Most of the previous studies which have investigated the determinants modulating the perception of the time of brief events have considered factors that were consciously sensible, for example, cognition of the non-temporal attributes of events, and the level of attention to the elapsed time. In other words, previous studies have examined factors that are at least partly conscious. There is, however, an unanswered question: is the perceived time span affected by completely unconscious factors? Specifically, when estimating the duration of a visual event, can a

earlier subthreshold experience of the same event vary the perceived duration of it? To our knowledge, the effect of an unconscious experience on time perception has not been studied. We therefore conducted the present study to clarify whether or not unconscious experience could have effects on time perception.

The experiment consisted of two phases. In the exposure phase, the participants viewed brief displays of nonsense syllables with backward masking so that they could not see what was presented. In the time perception phase, the participants estimated the duration for which a syllable was displayed, for either a previously presented syllable or for a new syllable. If the perceived duration was affected by the subthreshold exposures, then we believed that there would be differences in the estimated durations of the displays of the new and the previously presented syllables.

Method

Participants Twelve naive students participated in the main experimental sessions and ten participated in the discrimination task.

Stimulus materials The stimuli were 50 nonsense syllables each consisting of two Japanese *katana* characters. All of the stimuli were displayed

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as white on the grey background of a computer screen.

Procedure

Exposure phase Fifteen randomly chosen syllables were assigned to each of three conditions: the 0-exposure, the 1-exposure, and the 10-exposure condition. During the exposure phase, 15 items from the 10-exposure condition were presented 10 times and 15 items from the 1-exposure condition were presented once, in a random order, resulting in 165 exposures. The participants pressed the space bar of the computer keyboard to begin a sequence. After the display of a fixation dot for 2 seconds, a syllable was presented in the centre of the monitor screen for 12.5 ms, and this was immediately followed by the display of a pattern mask for 100 ms. The participants were instructed to pay close attention to the flashing patterns on the screen.

Time perception phase After the exposure phase, the participants were instructed to make comparative judgments of the duration of the standard and comparison stimuli. When the participants pressed the space bar to begin each trial, a fixation dot was first presented for 1 second, then a square filled with random dots followed for 300 ms, as the standard stimulus. After a blank of 1 second, a syllable appeared for either 100, 200, 300, 400, or 500 ms, as the comparison stimulus. The ratio of the duration of the display was balanced over all conditions. The participants were given three sheets of paper on which 20 horizontal lines were printed. The participants were told to mark anywhere on a line to indicate the duration of the comparison stimulus relative to the standard, the duration of which was represented as one half the length of a line.

Discrimination task This task was to confirm that the presentations of the stimuli in the exposure phase were subthreshold. The 50 nonsense syllables and 50 blanks were each displayed for 12.5 ms in an unpredictable order. Each exposure was preceded by a 2 second fixation period and followed by a pattern mask of 100 ms. The participants reported whether the syllables were presented or not.

Table 1

The mean estimated duration (in ms) as a function of the exposure frequency in the exposure phase.

Exposure frequency	0	1	10
Estimated duration	228.00	224.57	218.57
SD	(26.12)	(31.08)	(28.09)

Results and Discussion

The mean of the estimated duration under each condition is presented in Table 1. An analysis of variance, with the exposure frequency as a within-subject variable, was used to statistically examine the data. The analysis revealed a significant main effect of exposure frequency, $F(2, 22)=3.75$, $p<.05$. Multiple comparisons (Ryan's method) indicated that the mean estimated duration of the 10-exposure condition was significantly less than that of the 0-exposure condition, $t(22)=2.74$, $p<.05$. The result indicated that the perceived duration was affected by repetitive presentation. Specifically, repetitive exposures of the visual stimuli reduced the perceived duration of the stimuli.

The mean number of correct identifications in the discrimination task across all of the participants was 51.3 (of 100 measurements, $SE=3.23$). Overall, the participants correctly identified 513 of 1,000 exposures, a result which does not differ significantly from chance, $\chi^2(1, N=1,000)=0.67$. The results of the discrimination task confirmed that the presentation of the syllables in the exposure phase was subthreshold.

In all, our results are the first to report the effect that a previous subthreshold experience can reduce the perceived duration of an event. This study therefore adds unconsciousness factors to the list of determinants which can affect time perception.

References

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