

Influence of modality of dividers on filled duration illusion

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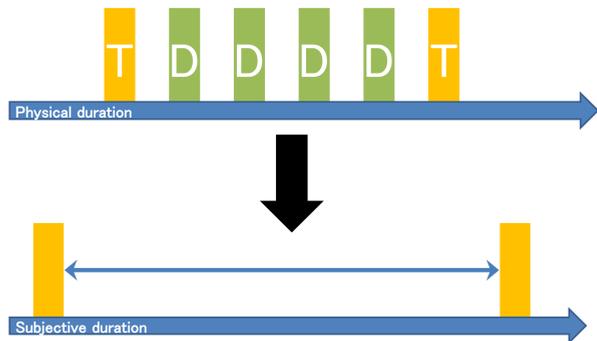
Introduction

Difference of modality on time perception

- Visual processing of the time(temporal location or duration) is less accurate than auditory processing (Grondin,2010).
- Visual processing of the time is influenced by auditory signal (Keetels et al., 2011; Heron et al., 2013).

Filled duration illusion (FDI)

- During interval of signals (targets), the occurrence of additional sensory signals (so called 'divider') increases perceived duration of this interval (Thomas, 1978). This is called the 'filled duration illusion' (FDI).
- It was confirmed that FDI is occurred when modalities of stimuli were visual interval with auditory dividers and duration perceived was enhanced when participants paid attention to dividers (Mitsudo et al., 2012).



Goal of this study:

Understanding the effect of divider's modality on FDI and multimodal interaction of time-perception systems.

Stimuli

Visual : ● target (T) and 4 times of flashed dividers (D) as ○

Auditory : 1000Hz (T) and 500Hz(D) in 70dB

Interval between Targets : 700ms(referred interval) and another for being compared (varied from 550ms to 1030ms). The sequence of referred and compared intervals in a trial were counterbalanced.

Method

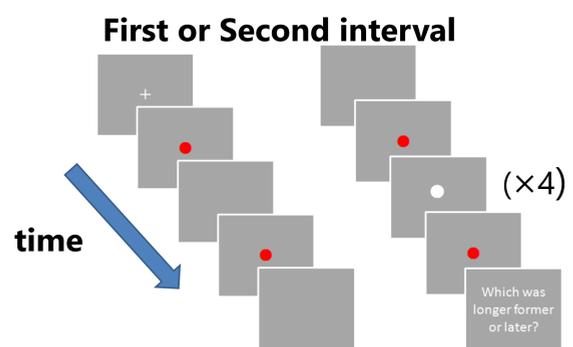
Participant: 8 males and 2 females (aged 20-25 years)

In one trial, two intervals(referred and compared in of target stimuli) were presented sequentially.

Each interval was consisted of two sensory signals, A_A (two auditory signals) or V_V (two visual signals),and divider's stimuli were inserted in referring interval.

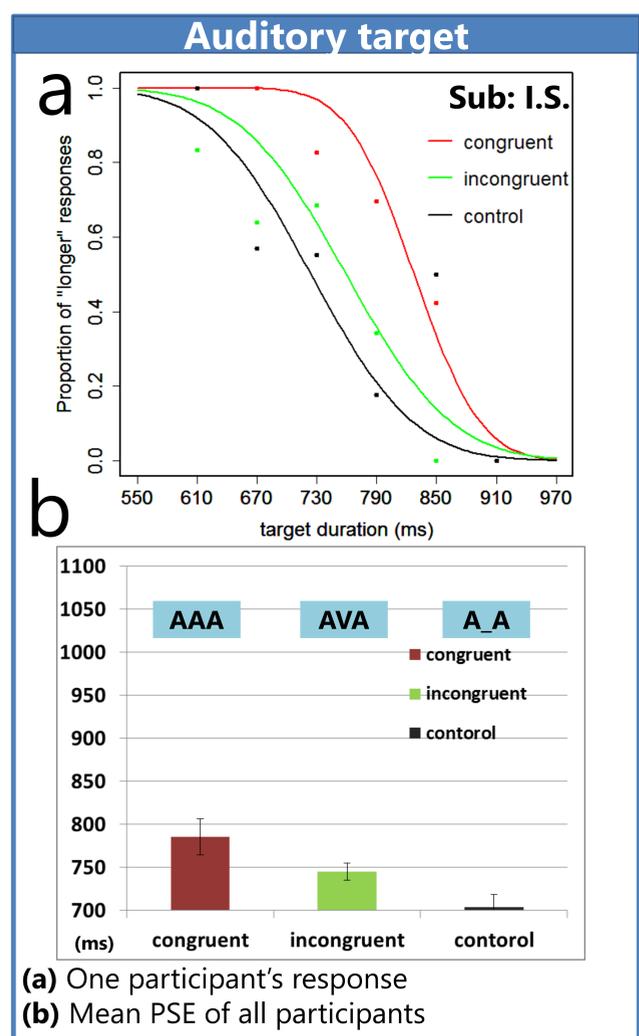
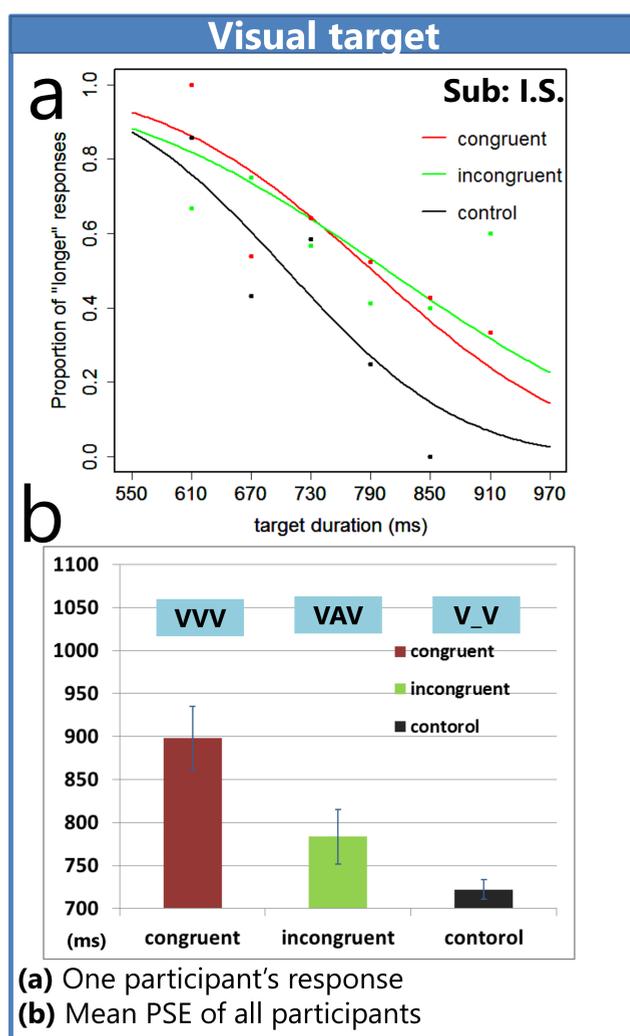
Task was 2AFC (selecting the longer interval, former or later),and compared interval was varied with participant's response. If previous response was correct, the interval duration got closer to 700ms. On the other hand, if the responses were wrong twice in succession, the interval duration stepped away from 700ms.

Divider/Target	Visual target	Auditory target
Visual divider	V_V_V	A_V_A
Auditory divider	V_A_V	A_A_A
Control	V_V_V	A_A_A



Presentation's order of each interval was random.

Results: Comparing modalities of Target and Divider



A 2-way ANOVA : target modality(2: visual & auditory) * divider congruency(3: congruent, incongruent, and control)

- The points of subjective equality(PSEs) in visual target conditions were higher than those in auditory target conditions [$F(1,9)=19.3, p=.0017$].
- 'Filled duration illusion' was much enhanced when dividers' modality was identical to target modality [$F(2,18)=18.1, p=.0000$].
- There was no significant interaction between target and dividers' congruency [$F(2,18)=2.02, p=0.162$].

A 2-way ANOVA : target modality(2: visual & auditory) * divider modality(2: visual & auditory)

- Dividers' modality (visual or auditory) did not affect to PSE [$F(1,9)=1.5, p=.2454$] and had no interaction [$F(1,9)=1.1, p=.3251$].

This result suggests that the visual processing of the time is not only less accurate than auditory processing (Grondin,2010) but also strongly influenced by temporal interruptions.

Conclusion

Modality congruency effect is stronger than difference of modality on filled duration illusion. This indicates that visual and auditory signal processing on perceptual system on time are connected but not processed in a single system - somewhat several systems should be engaged.