Chapter 11
Research on Current Situations for Functional Classification of Timing

Zhihan Xu
Okayama University, Japan

Qiong Wu
Okayama University, Japan

Chunlin Li
Capital Medical University, China

Yujie Li
Central China Normal University, China

Hongbin Han
Peking University, China

Dehua Chui
Peking University, China

Satoshi Takahashi
Okayama University, Japan

Jinglong Wu
Okayama University, Japan

ABSTRACT

Time is a fundamental variable that must be quantified by organisms to survive. Depending on the previous functional definition, timing can be divided into explicit timing and implicit timing. For an explicit timing task, the estimation of the stimulus duration is given in the form of perceptual discrimination (perceptual timing) or a motor response (motor timing). For implicit timing, participants can subconsciously (exogenous) or consciously (endogenous) establish temporal expectation. However, the ability of humans to explicitly or implicitly direct attention in time varies with age. Moreover, specific brain mechanisms have been suggested for temporal processing of different time scales (microseconds, hundreds of milliseconds, seconds to minutes, and circadian rhythms). Furthermore, there have been numerous research studies on the neural networks involved in explicit timing during the measurement of sub-second and supra-second intervals.


Copyright ©2017, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.
FUNCTIONAL CLASSIFICATION OF TIMING

Temporal processing is crucial for human behavior and cognition. It allows us to determine what is occurring in our environment and when to respond to events. The ability to direct attention to task-relevant information can enhance our behavioral performance. Temporal orienting selective attention is central for optimizing performance by biasing the neural processing of relevant information and suppressing irrelevant items (Moran & Desimone, 1985). Coull and Nobre (2008) suggested that tasks used temporal cues might be divided on the basis of whether the cue is explicitly or implicitly processed. Explicit timing is engaged when the participants make a deliberate estimate of a discrete duration. Implicit timing is engaged, even without a specific instruction to time, whenever sensorimotor information is temporally structured and can be used to predict the duration of future events. In explicit timing, the subjects are instructed to pay attention to the duration of a stimulus. In contrast, implicit timing requires the participants to perform tasks in which timing is important but not the main focus of the task (J. Coull & Nobre, 2008). For example, in a collision judgment task, participants must judge the speed of one or more objects that are moving and then predict the future location of the objects. Thus, this temporal processing focuses on collision judgment; however, time is not central to the task. The critical distinction between explicit timing and implicit timing is whether the task instructions require the participants to afford an overt estimate of duration.

Explicit Timing

In explicit timing, subjects must provide an overt estimate of the inter-stimulus interval (ISI) or the stimulus duration. One form of this estimation is perceptual timing (perceptual discrimination), in which subjects discriminate whether one ISI or stimulus duration is shorter or longer than another (J. T. Coull, Cheng, & Meck, 2011). For example, in the temporal discrimination task, subjects compare a new duration ($t_2$) with a duration ($t_1$) that was previously stored in the reference or working memory; the subject then determines which duration is longer (Figure 1a). Another form of explicit timing is motor timing (motor production), in which subjects represent the ISI or timed duration with a delayed, sustained, or periodic motor act. For example, the task most commonly used to examine motor timing is the temporal reproduction task and the paced finger tapping task. In the temporal reproduction task, subjects reproduce the standard target sensory stimulus duration ($t$) by producing a sustained motor response whose duration ($t_e$) corresponds to the standard duration (Figure 1b). In the paced finger tapping task. During the synchronization phase, the subjects press the button simultaneously with the sen-
Related Content

Inherent Requirements and Social Work Education: Issues of Access and Equity
Steve Boucher (2019). Mental Health Policy, Practice, and Service Accessibility in Contemporary Society (pp. 57-73).
www.igi-global.com/chapter/inherent-requirements-and-social-work-education/213559?camid=4v1a

Potentials of Digital Assistive Technology and Special Education in Kenya
www.igi-global.com/chapter/potentials-of-digital-assistive-technology-and-special-education-in-kenya/189345?camid=4v1a
MRI-Compatible Haptic Stimuli Delivery Systems for Investigating Neural Substrates of Touch
Jiabin Yu, Zhiwei Wu, Jiajia Yang and Jinglong Wu (2017). Improving the Quality of Life for Dementia Patients through Progressive Detection, Treatment, and Care (pp. 236-248).
www.igi-global.com/chapter/mri-compatible-haptic-stimuli-delivery-systems-for-investigating-neural-substrates-of-touch/168935?camid=4v1a

What a Tangible Digital Installation for Museums Can Offer to Autistic Children and Their Teachers
www.igi-global.com/chapter/what-a-tangible-digital-installation-for-museums-can-offer-to-autistic-children-and-their-teachers/189344?camid=4v1a