

# Somatic Marker Feedback in Electromyogram Control

Yoichi Nagashima

(Shizuoka University of Art and Culture)

[nagasm@computer.org](mailto:nagasm@computer.org)

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My introduction :

**<http://nagasm.org>**



I am interested in :

not only **Perception**

but also **Recognition**



I am interested in :

not only **Exteroception**

(5 senses)

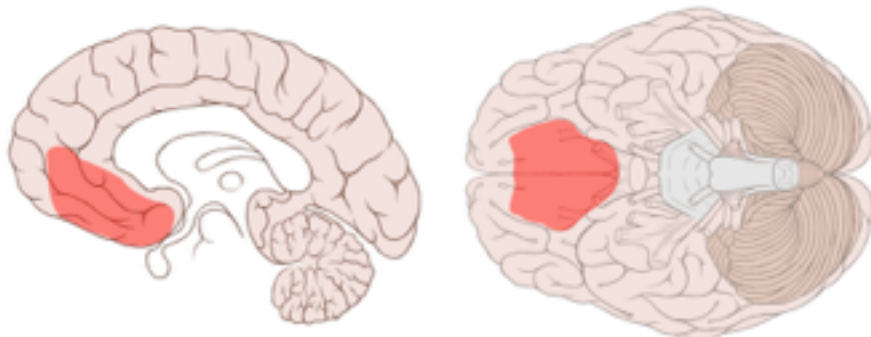
but also **Interoception**



# This is a tentative report

- about Applications
- by EMG sensing
- (with Emotion)

Ventromedial prefrontal cortex





# Original EMG Sensor

- New Instrument
- Psychological Experiment



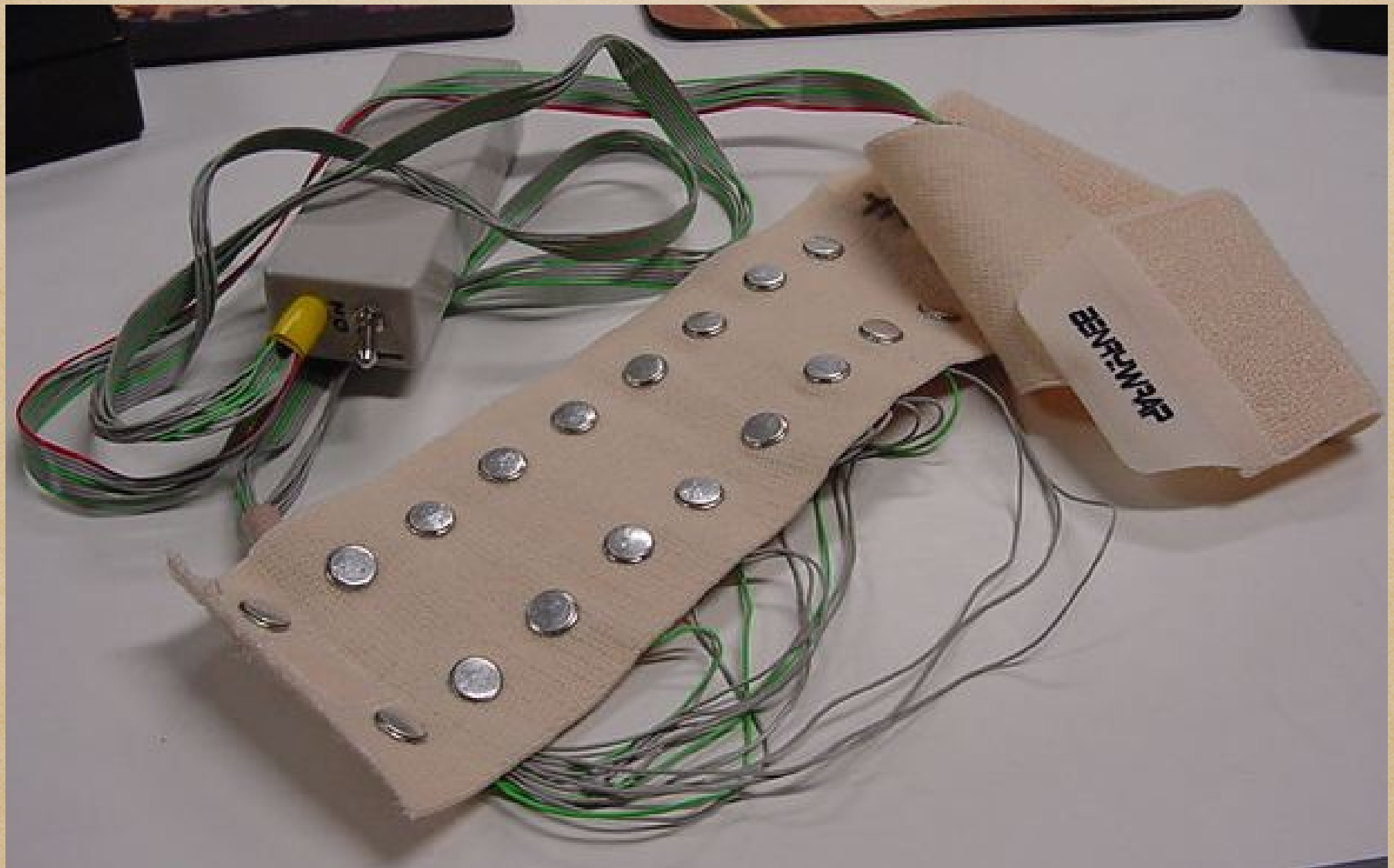
Somatic Marker Feedback in Electromyogram Control

# The 3rd generation of original EMG sensor

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## Somatic Marker Feedback in Electromyogram Control

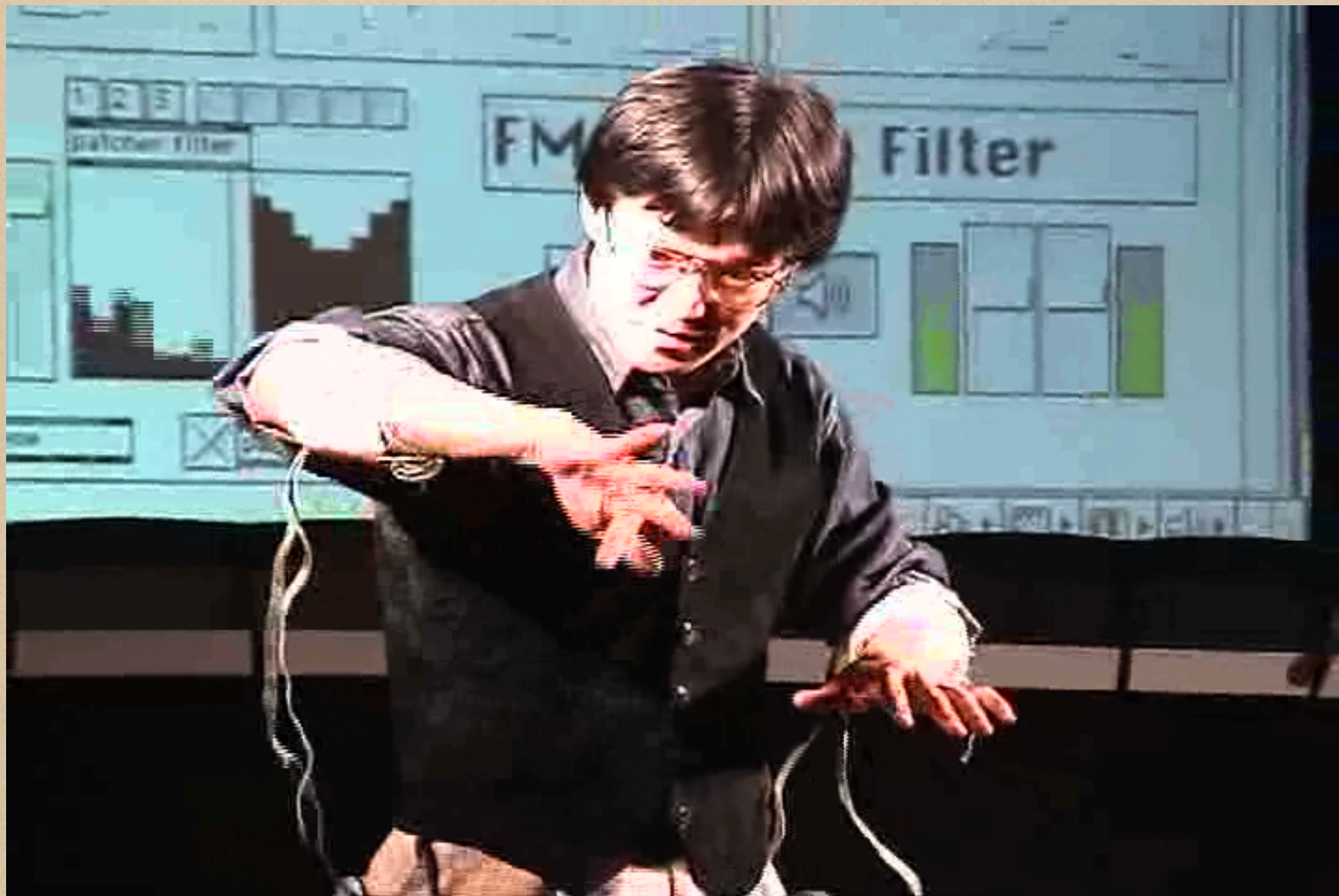


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Somatic Marker Feedback in Electromyogram Control

Kassel, Germany 2001



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Somatic Marker Feedback in Electromyogram Control

# Vancouver, Canada 2005



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My performances  
(YouTube Link) :

**<http://nagasm.org>**



# Original EMG Sensor

- New Instrument
- Psychological Experiment



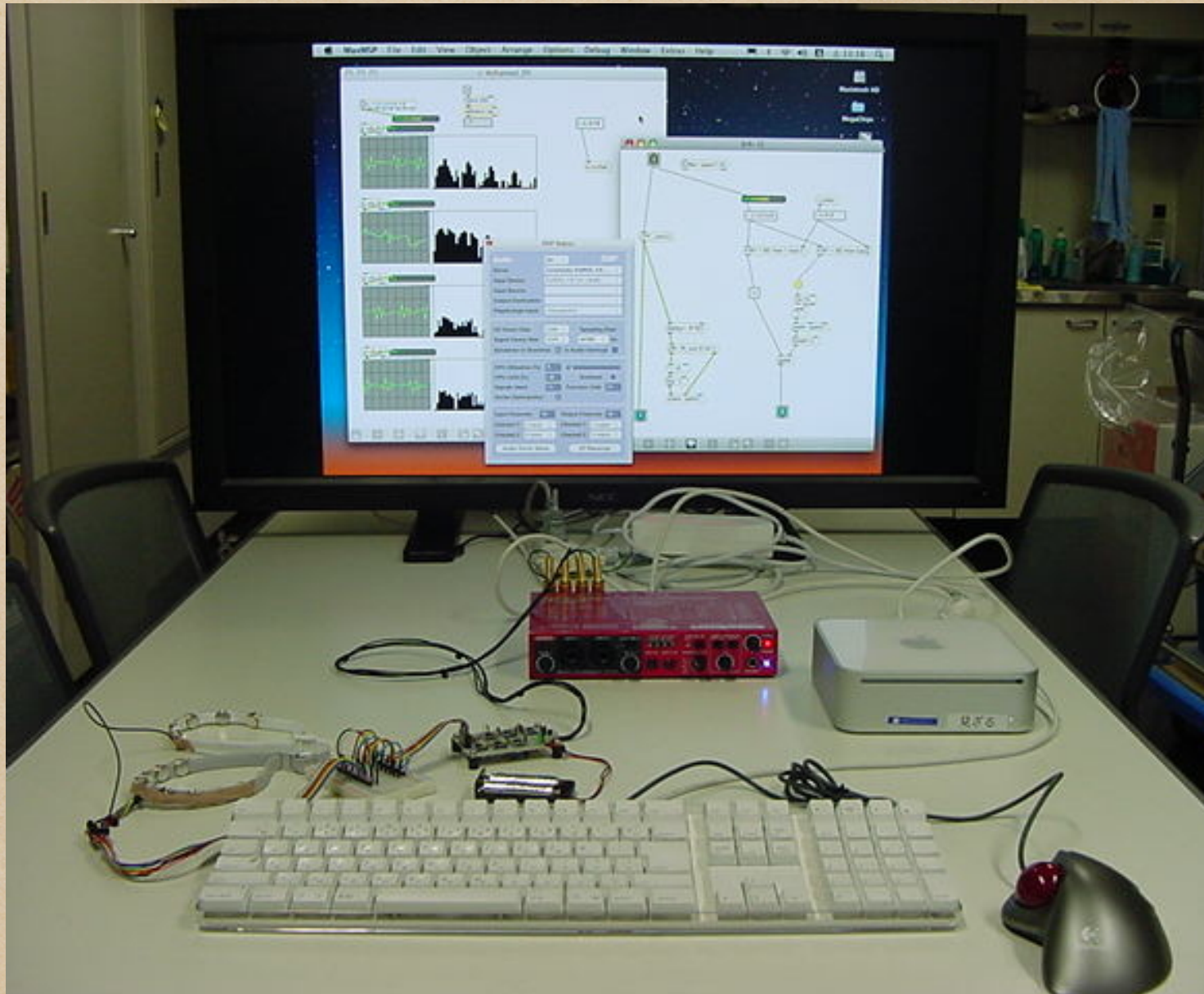
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# The 4th generation of original EMG sensor

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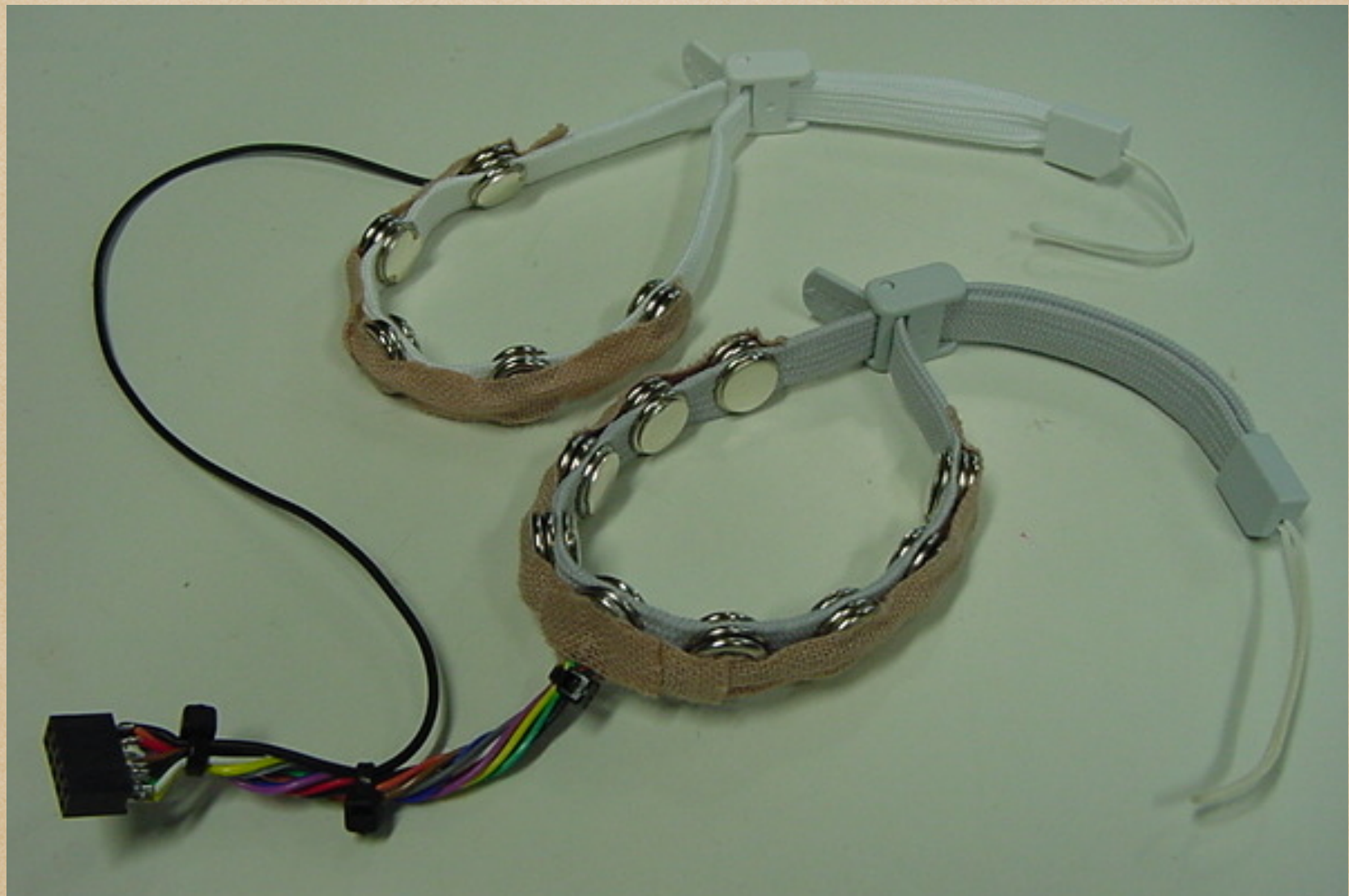
## Somatic Marker Feedback in Electromyogram Control



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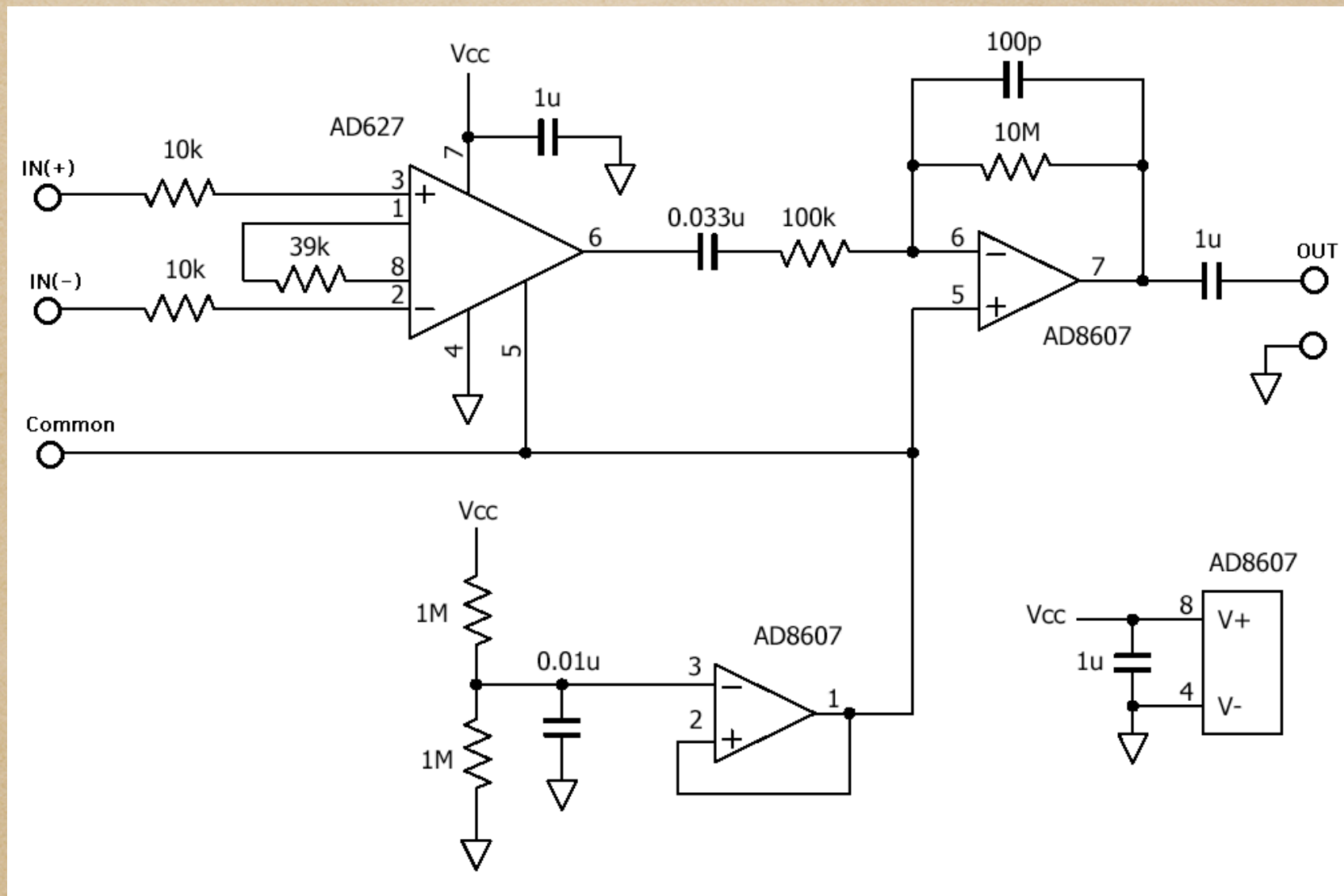
## Somatic Marker Feedback in Electromyogram Control



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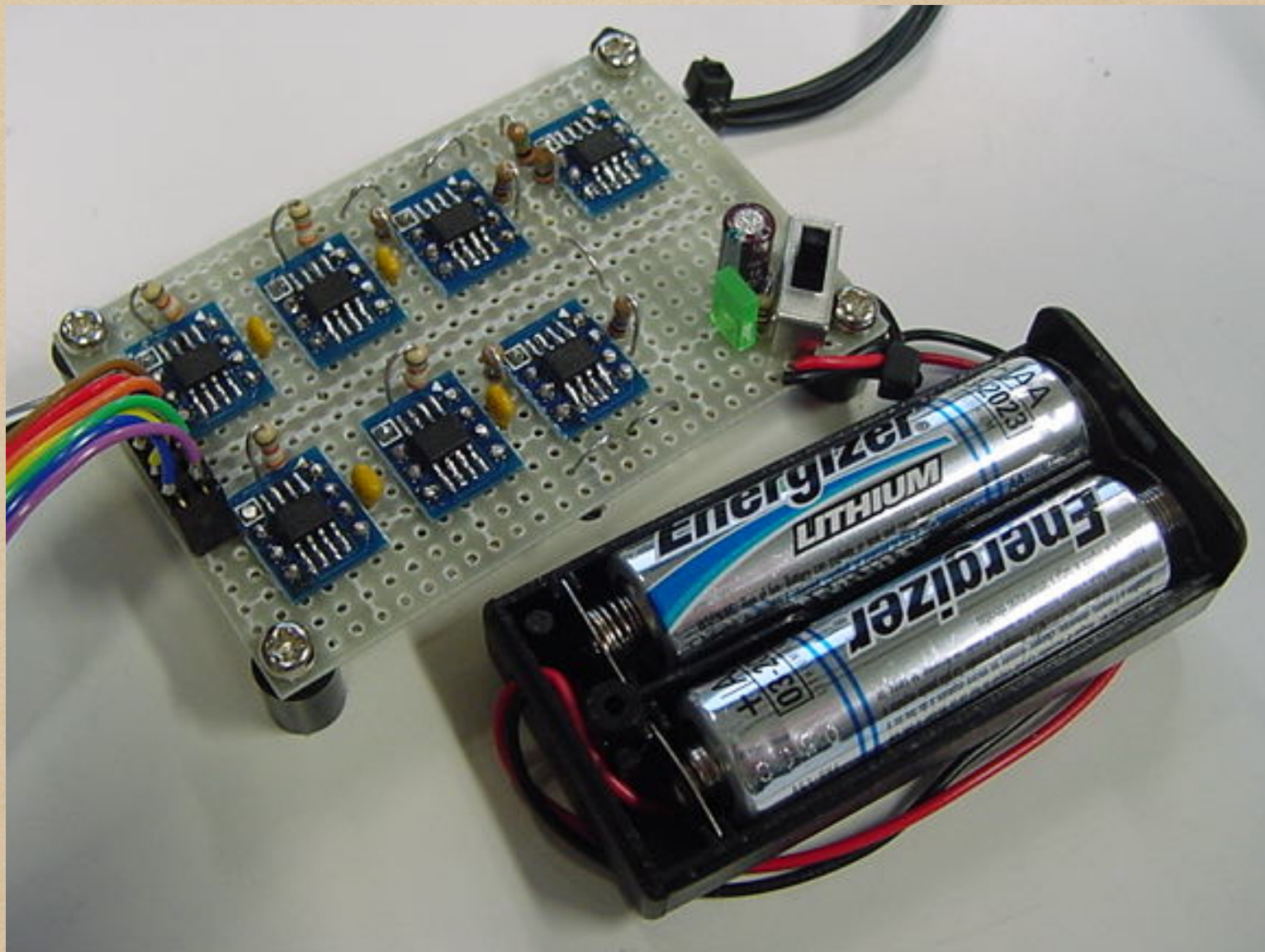


## Somatic Marker Feedback in Electromyogram Control





## Somatic Marker Feedback in Electromyogram Control



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Somatic Marker Feedback in Electromyogram Control

# Experiments Documents :

**<http://nagasm.org>**

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# Keywords(Theme) :

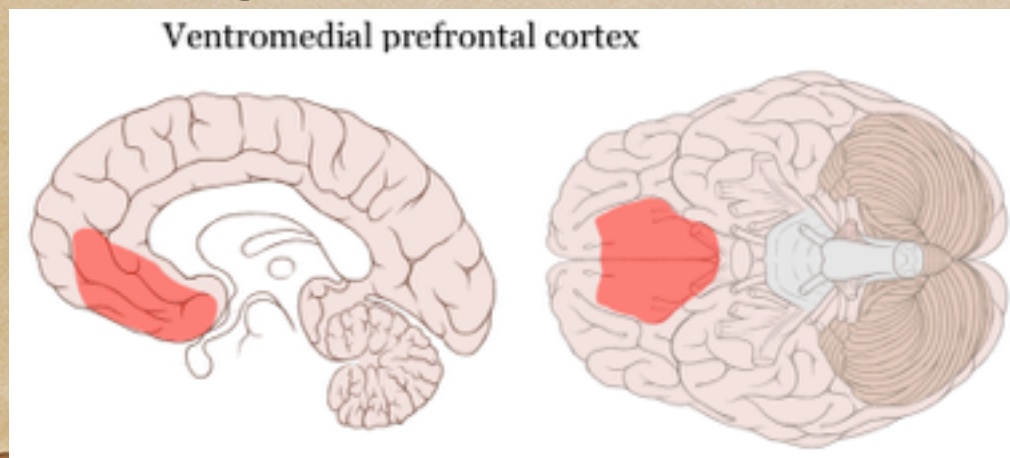
- Interoception and Emotions
- Somatic Marker Hypothesis
- EMG and Bio-Feedback
  - Entertainment in broad sense



# Somatic Marker Hypothesis (SMH)

[Antonio Damasio]

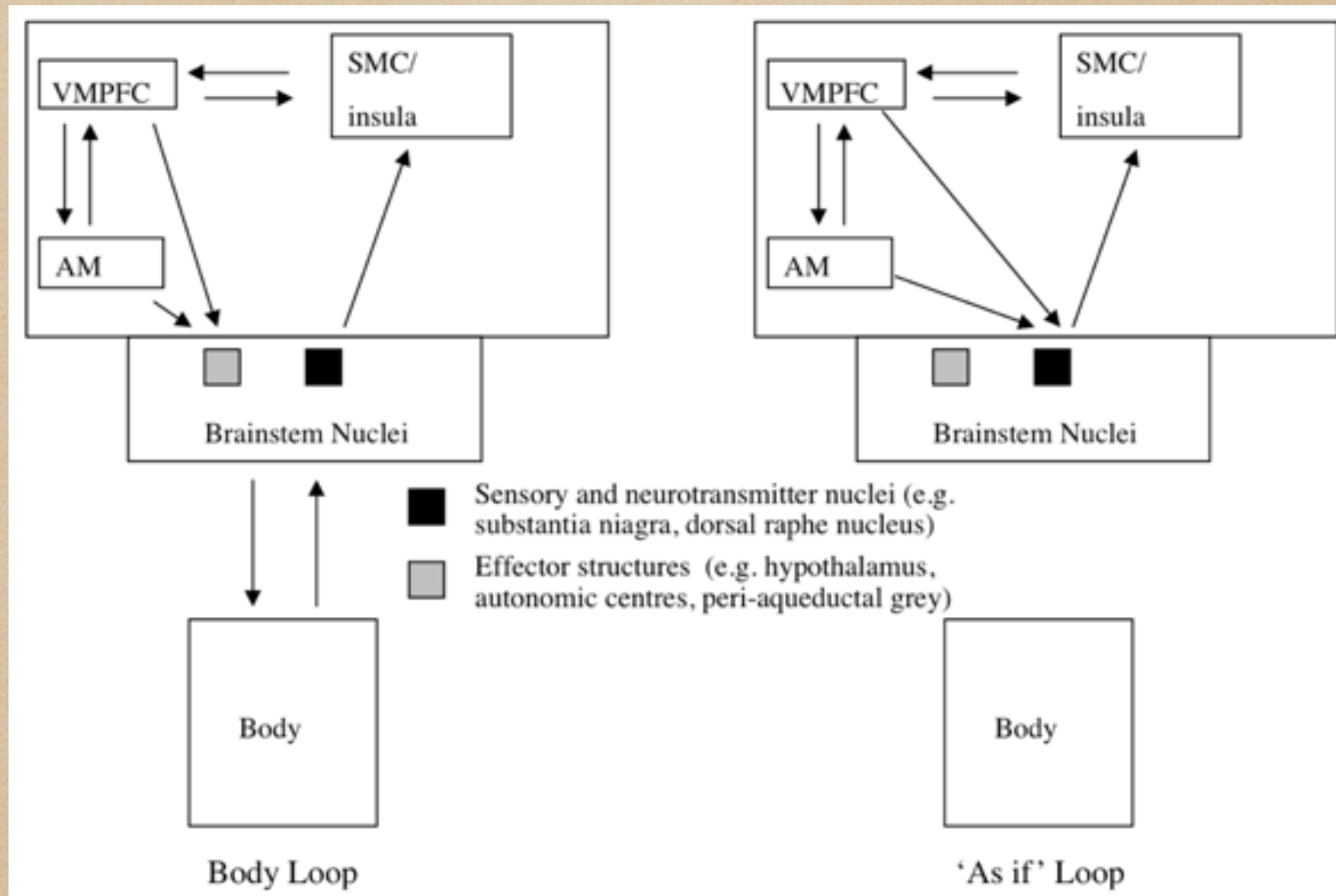
proposes a mechanism by which  
emotional processes can guide (or  
bias) behavior, particularly decision-  
making



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## Somatic Marker Feedback in Electromyogram Control



Dunn, B. D., Dalgleish, T., & Lawrence, A. D. (2006). The somatic marker hypothesis : a critical evaluation. *Neuroscience and Biobehavioral Reviews*, 30, 239-271.



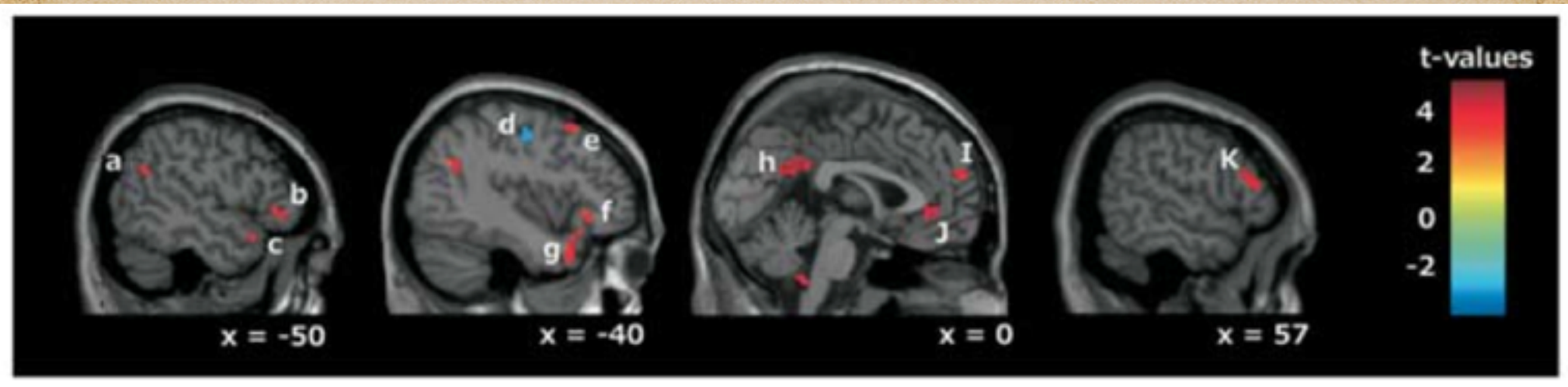
# Interoception:

The Interoception (internal sense) is "any sense that is normally stimulated from within the body".

Numerous sensory receptors in internal organs, such as stretch receptors that are neurologically linked to the brain.



# Interoception and Emotions



## Psychological and neural mechanisms of interoception and emotions

Yuri TERASAWA and Satoshi UMEDA (Japanese Psychological Review 2014, Vol.57, No.1, 49-66)

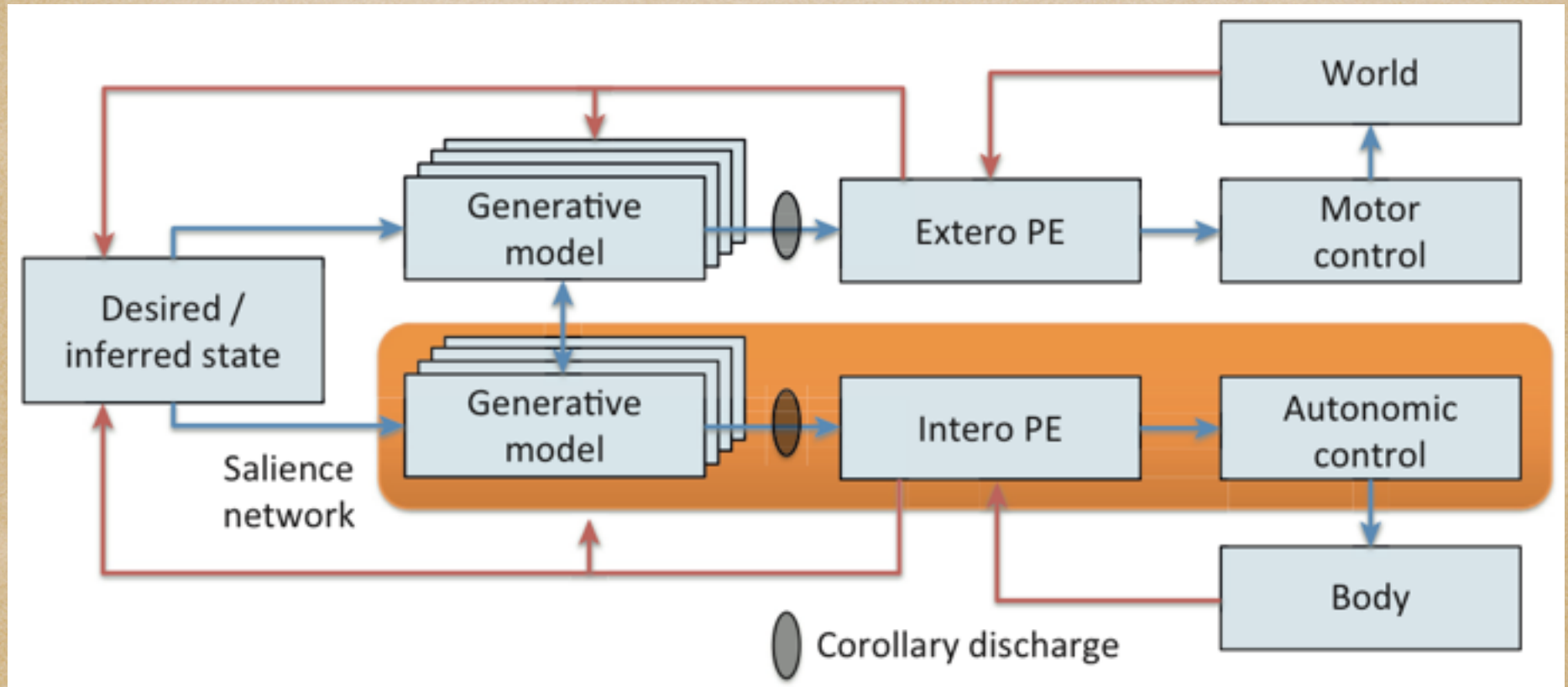
## Functional association of brain and body underlying affective decision-making

Hideki OHIRA (Japanese Psychological Review 2014, Vol.57, No.1, 98-123)

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# Interoception + SMH + Emotion



Interoceptive inference, emotion, and the embodied self

Seth, A. K. (2013)

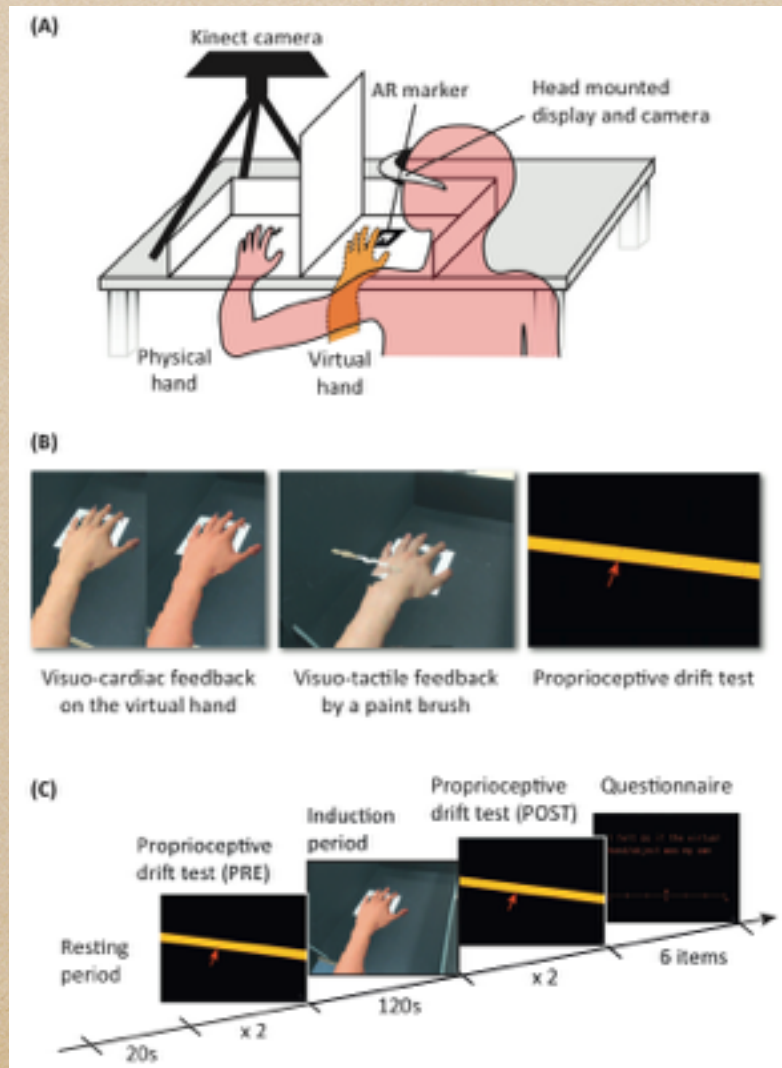
Trends in Cognitive Sciences, 17, 565-573.

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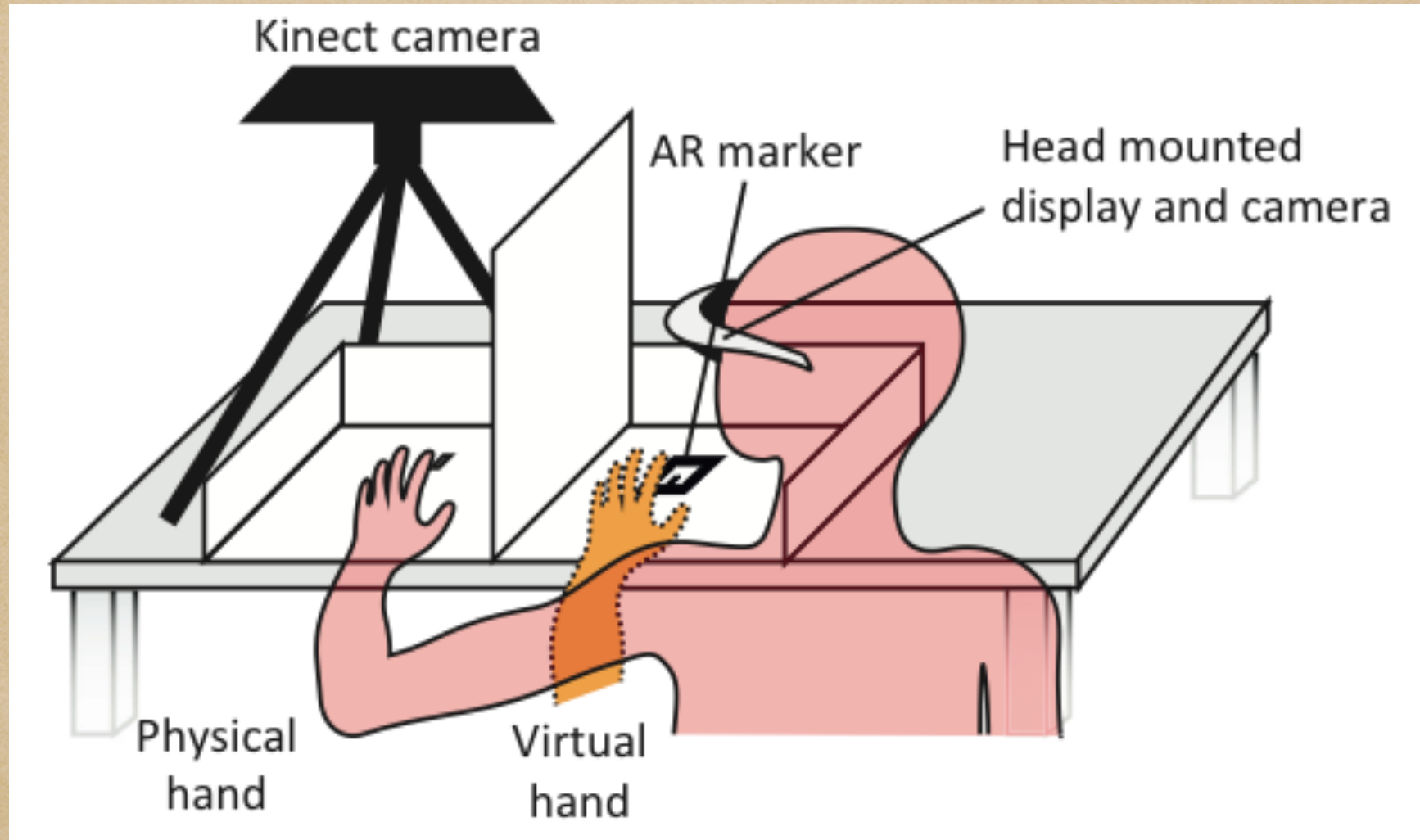
# Interoceptive Rubber-Hand Illusion

Seth(2013)





## Somatic Marker Feedback in Electromyogram Control



## Interoceptive inference, emotion, and the embodied self

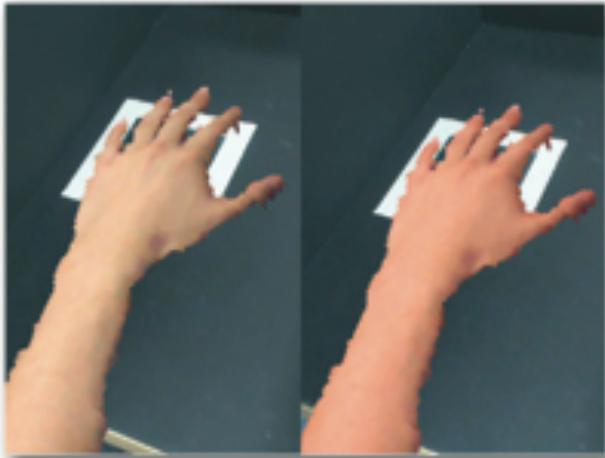
Seth, A. K. (2013)

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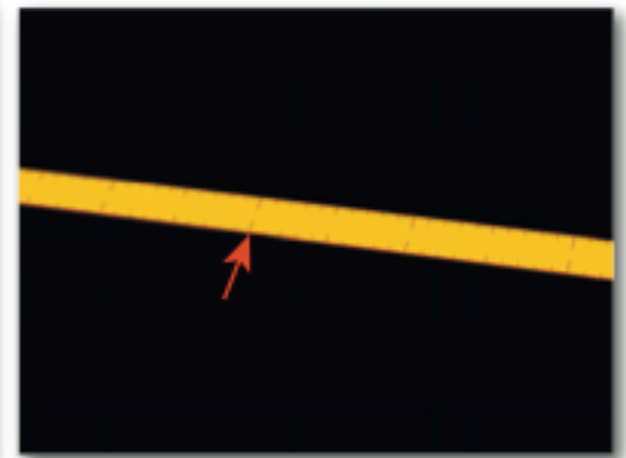
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Visuo-cardiac feedback  
on the virtual hand



Visuo-tactile feedback  
by a paint brush



Proprioceptive drift test

## Interoceptive inference, emotion, and the embodied self

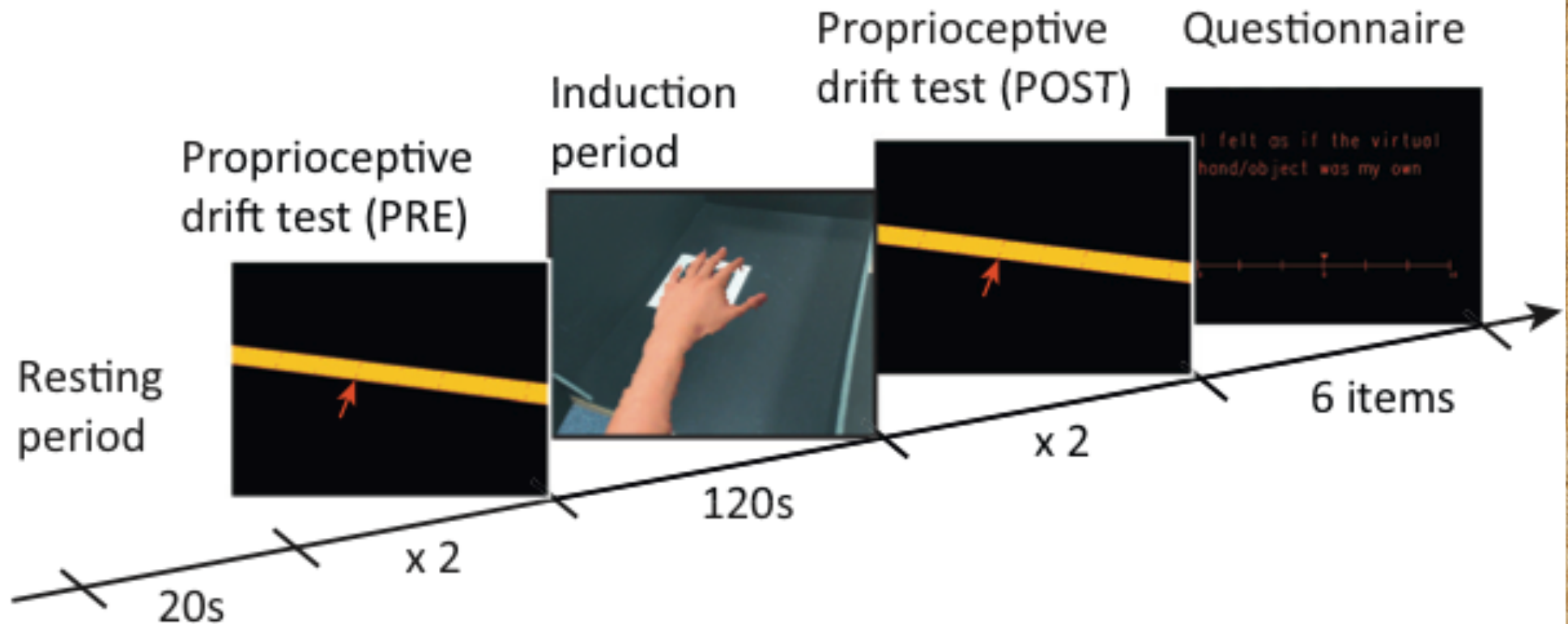
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## Somatic Marker Feedback in Electromyogram Control



## Interoceptive inference, emotion, and the embodied self

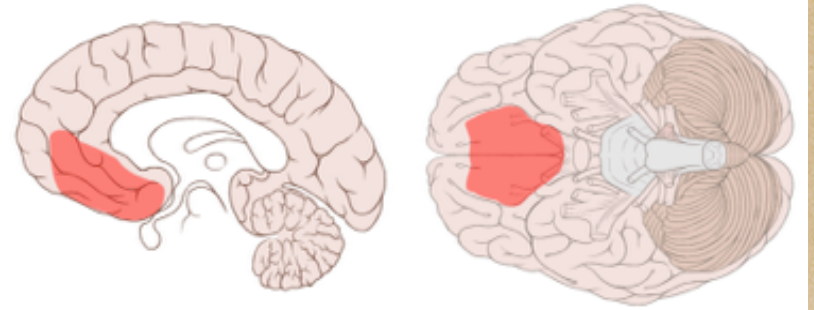
Seth, A. K. (2013)

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Ventromedial prefrontal cortex



# An idea :

## unconscious EMG control



## Interoception (path)



## Emotion / Entertainment

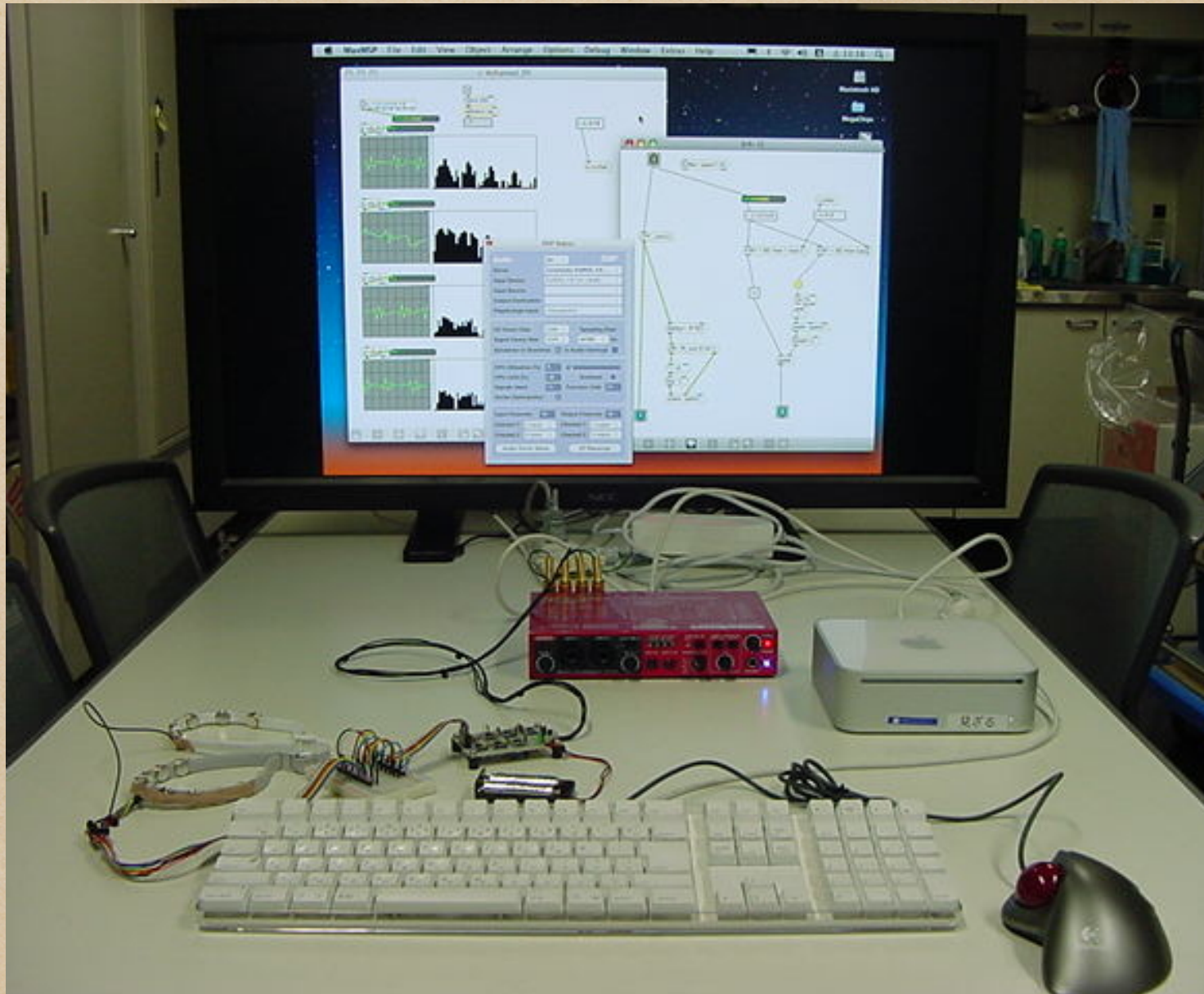


# Original EMG Sensor

- New Instrument
- Psychological Experiment



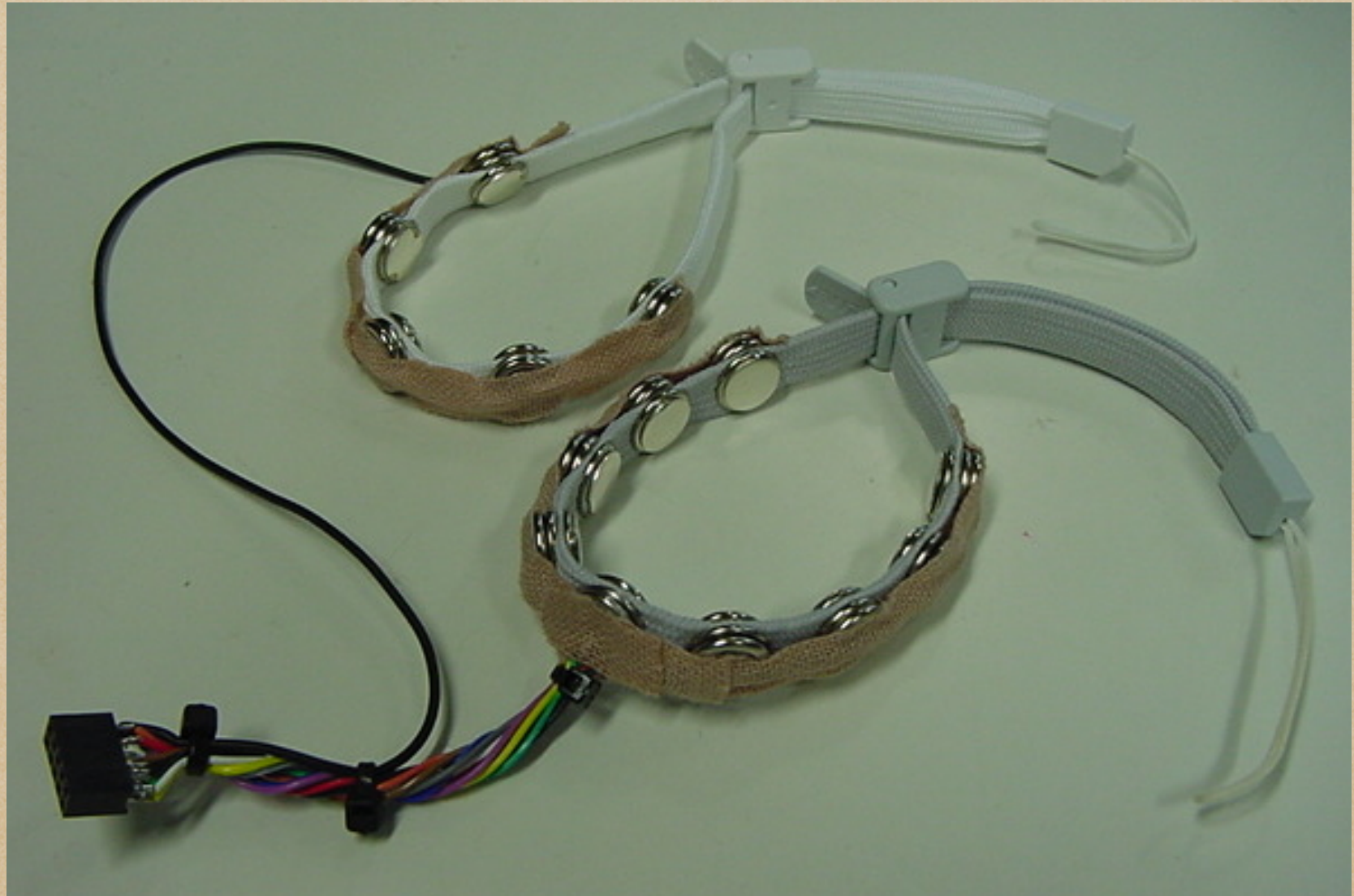
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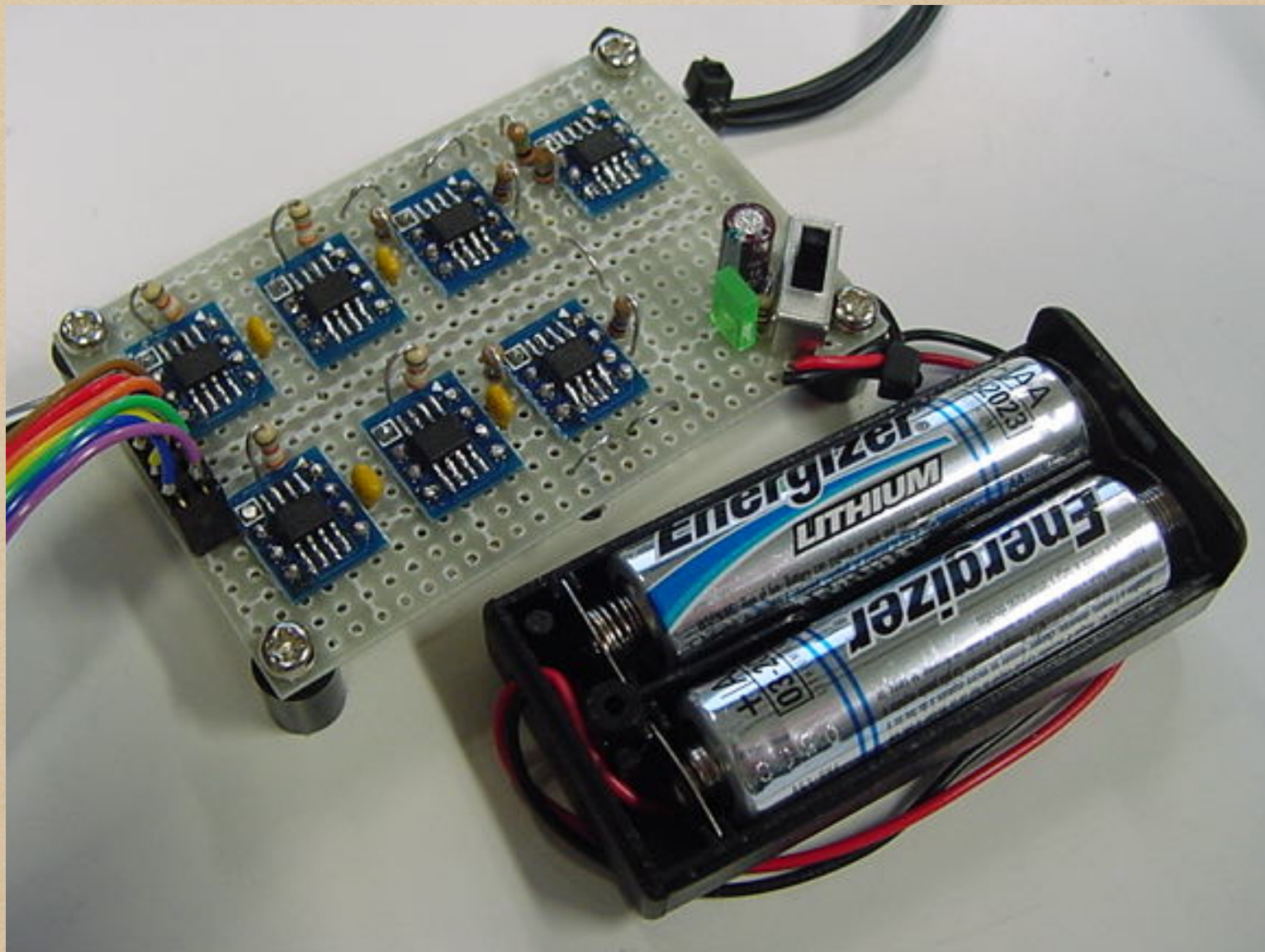
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## Somatic Marker Feedback in Electromyogram Control



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## Somatic Marker Feedback in Electromyogram Control

ポーズ・ジェスチャ



表現する意図・感情  
(優しく)こっちにおいて

ポーズ・ジェスチャ



表現する意図・感情  
(挑発的に)こっちに来い

ポーズ・ジェスチャ



表現する意図・感情  
侮蔑・挑発 "Fuck You !"

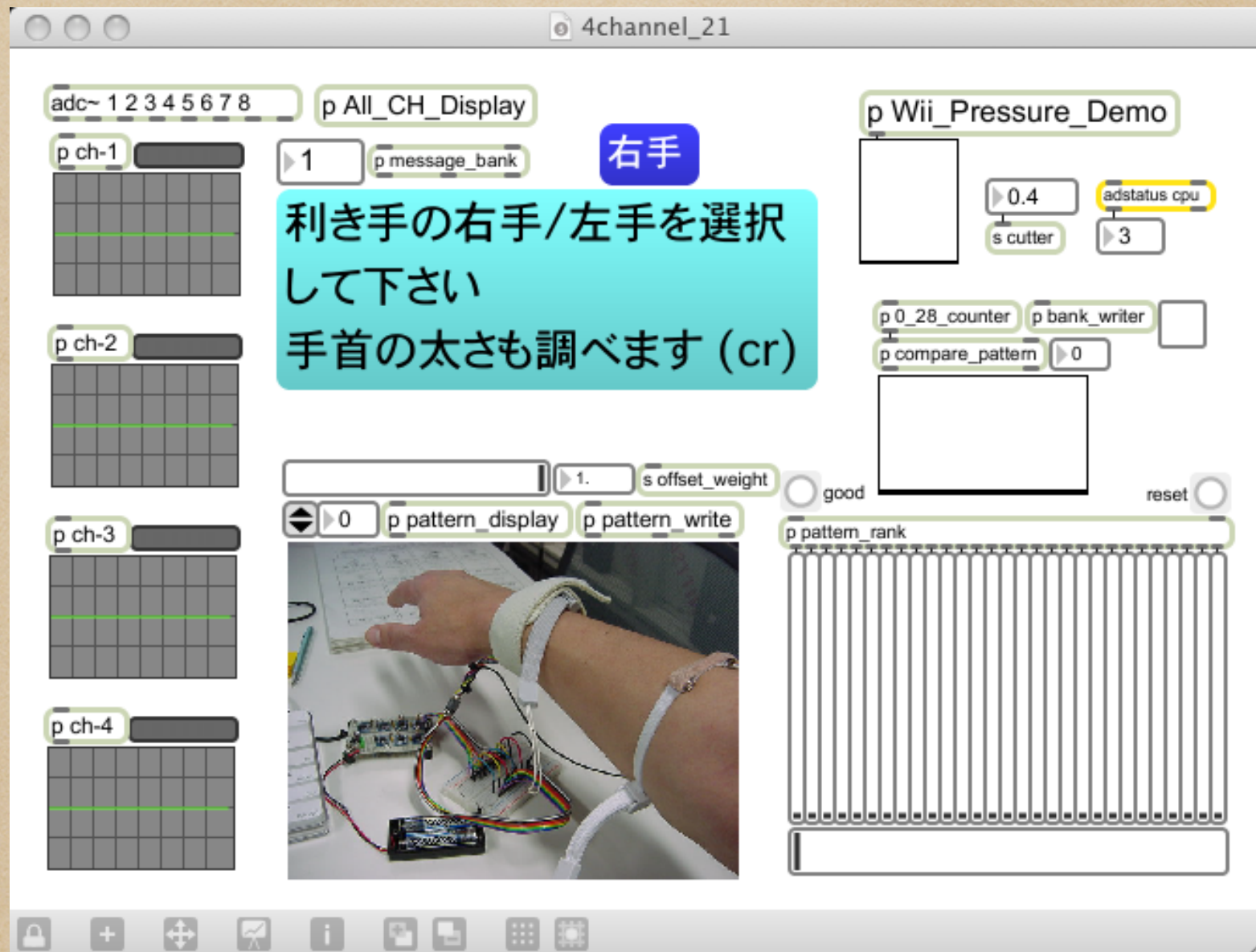
ポーズ・ジェスチャ



表現する意図・感情  
グッジョブ！

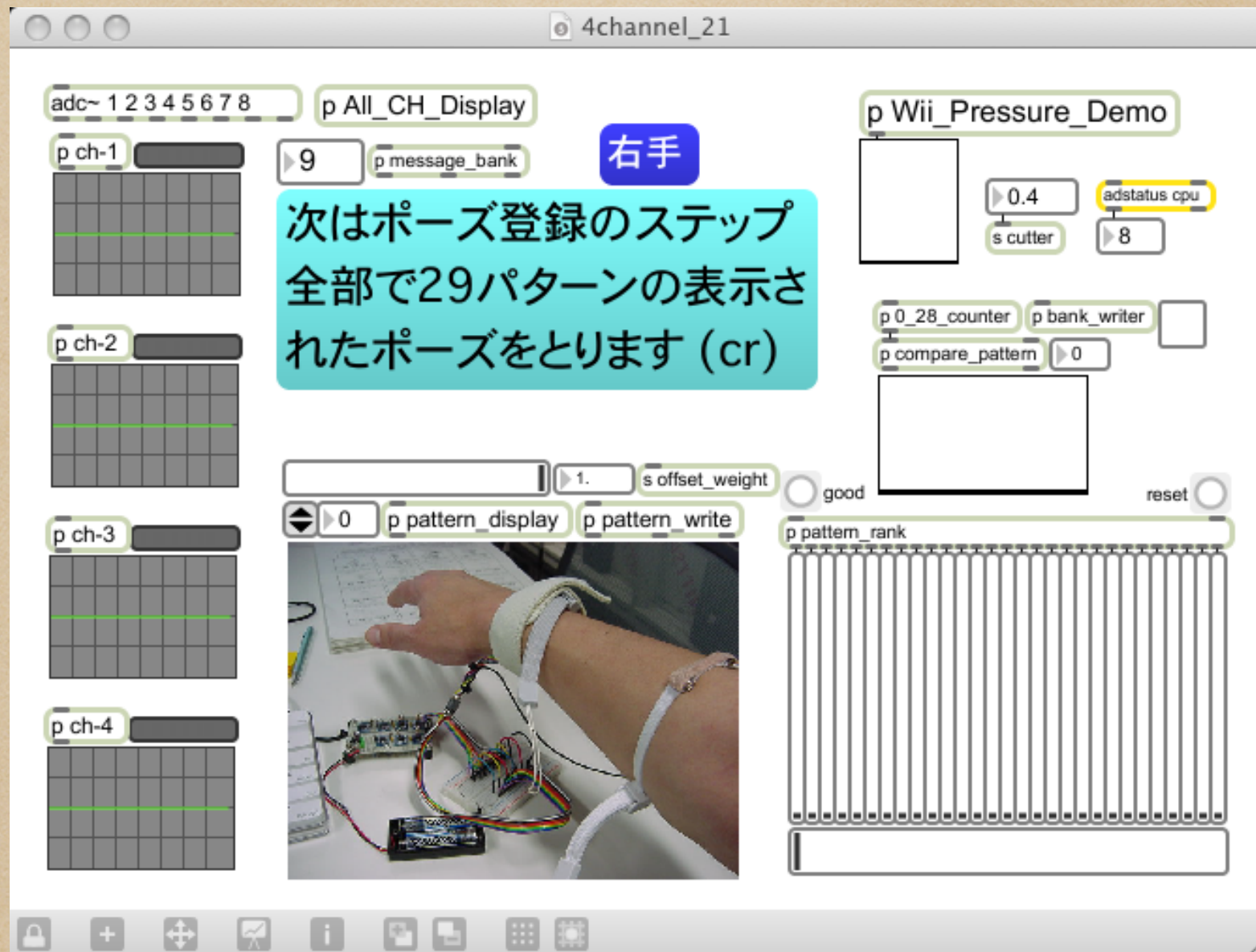


## Somatic Marker Feedback in Electromyogram Control



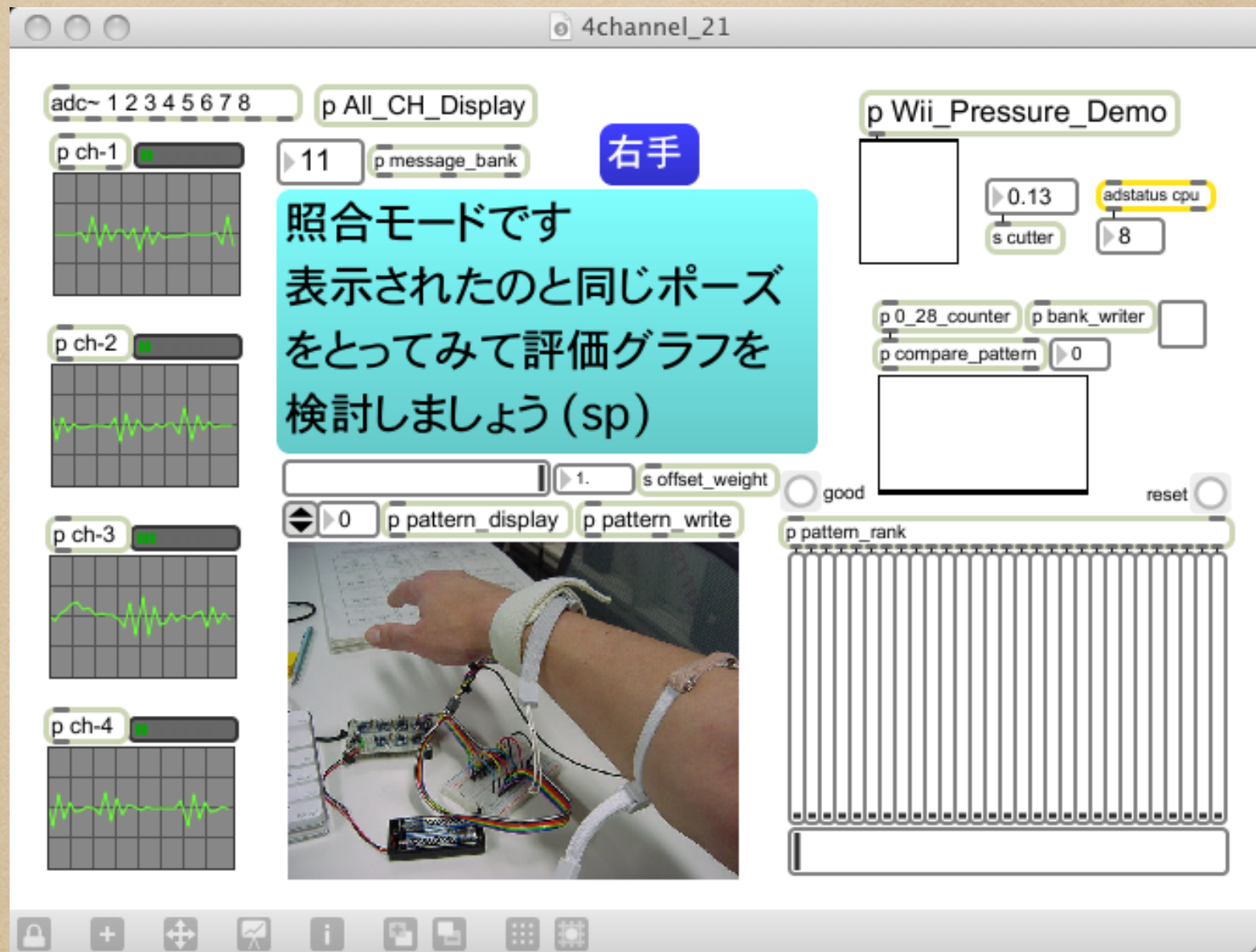


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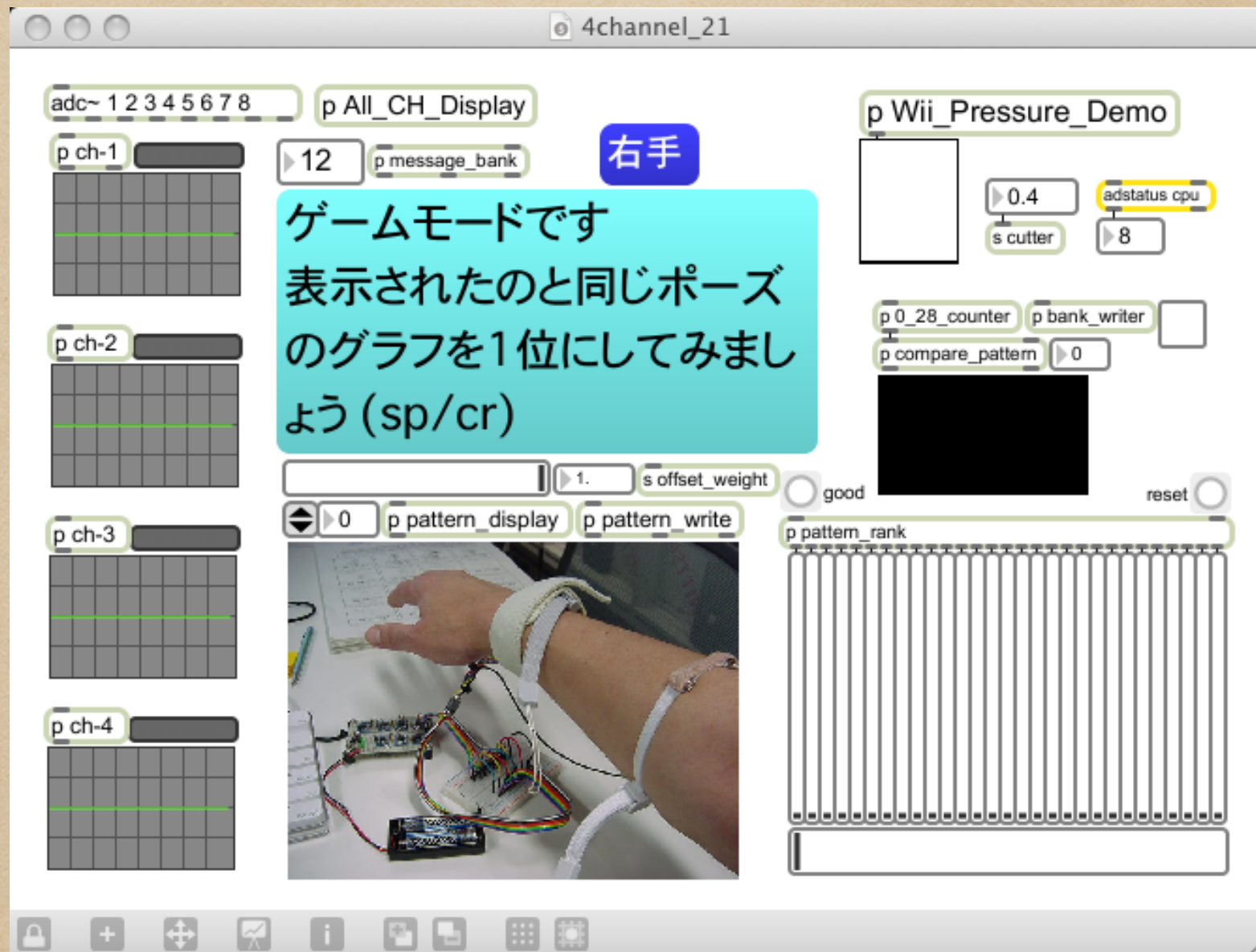


## Somatic Marker Feedback in Electromyogram Control





## Somatic Marker Feedback in Electromyogram Control





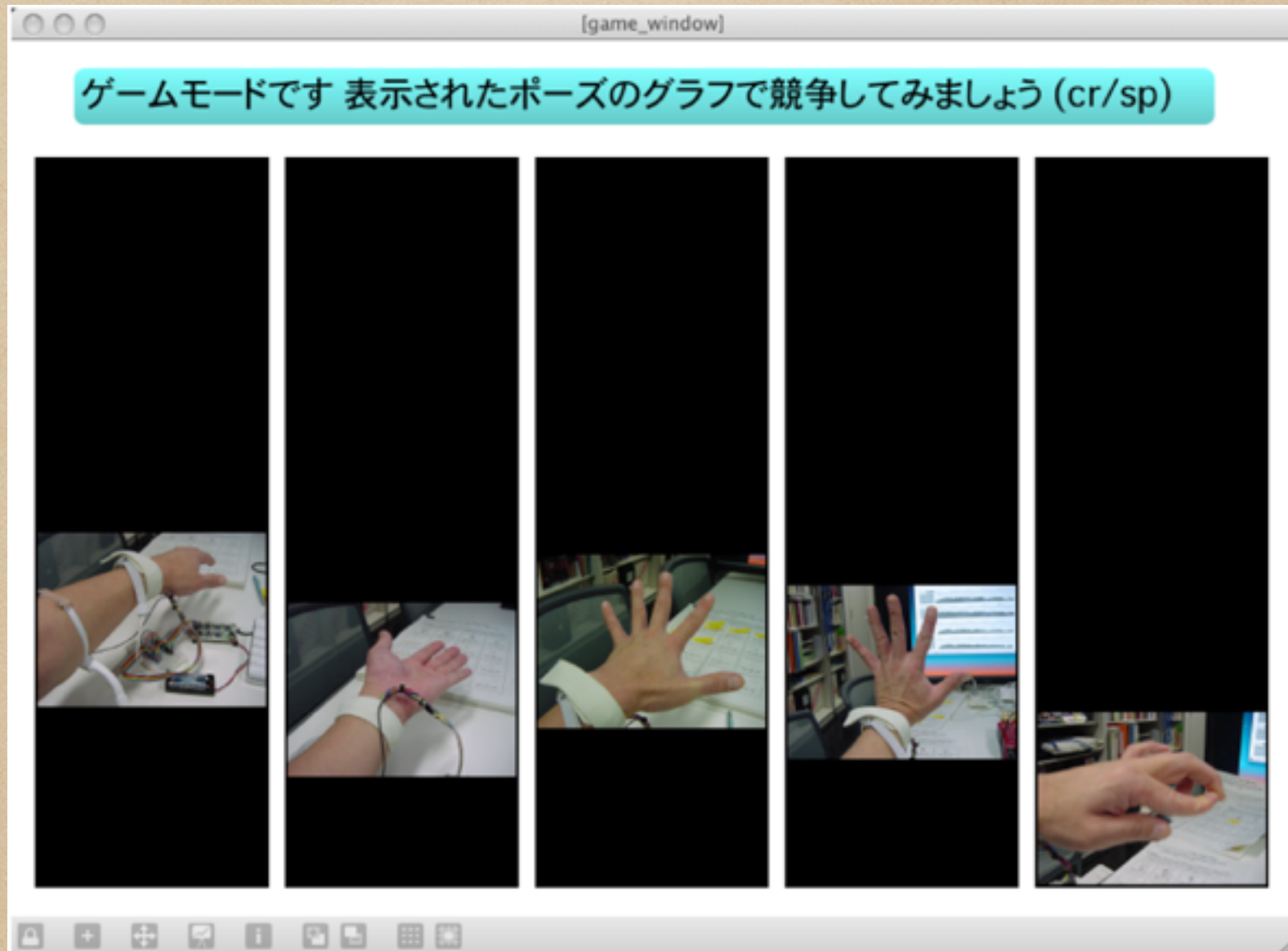
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## Somatic Marker Feedback in Electromyogram Control



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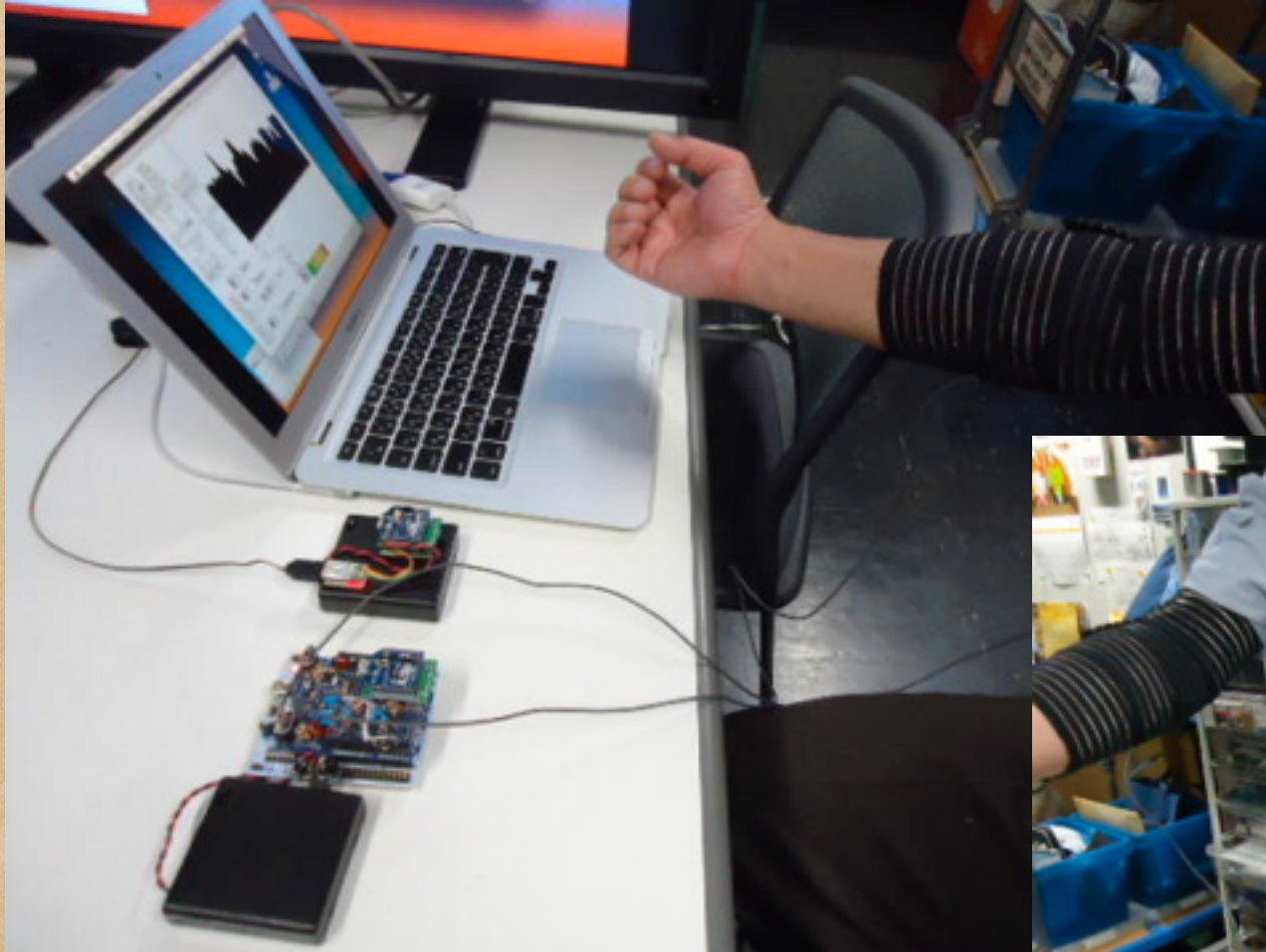
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# The 5th generation of original EMG sensor

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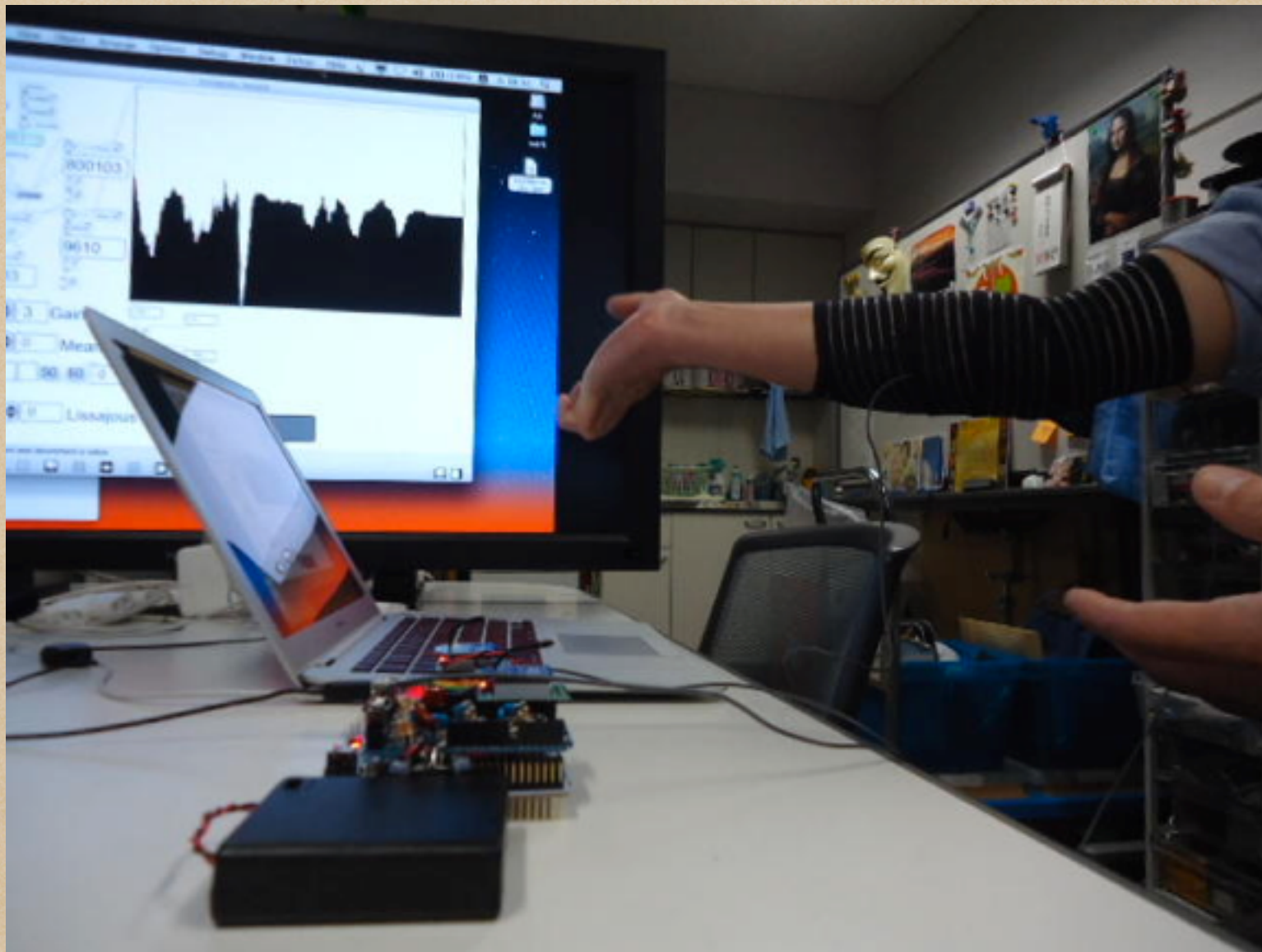


## Somatic Marker Feedback in Electromyogram Control





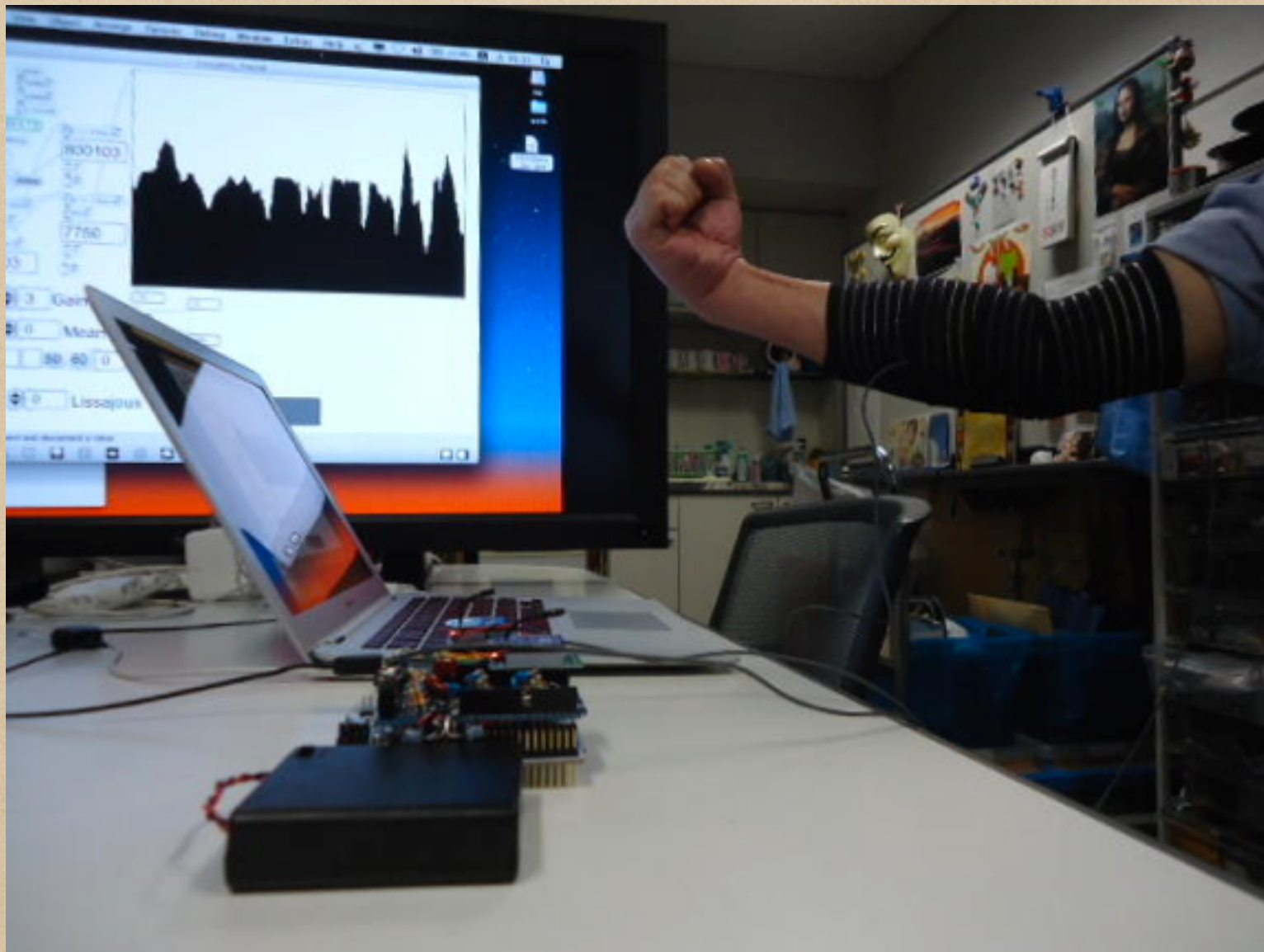
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## Somatic Marker Feedback in Electromyogram Control



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# Control with EMG Sensor

- Subjects can easily get used to control the EMG gestures with relaxing and stretching

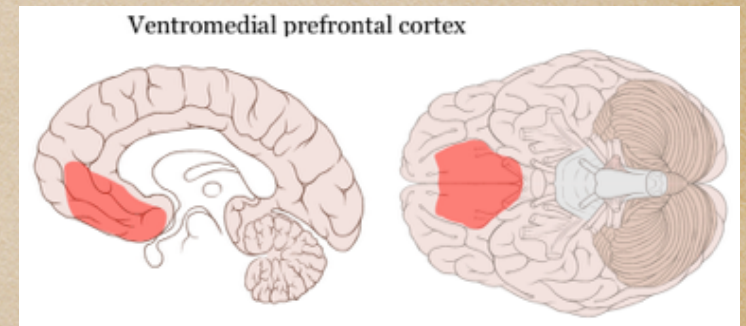


Interoceptive BioFeedback ??



# Application field

- rehabilitation
- relaxation
- entertainment





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# Short DEMO of Myo(EMG sensor)

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That's all, thank you.

