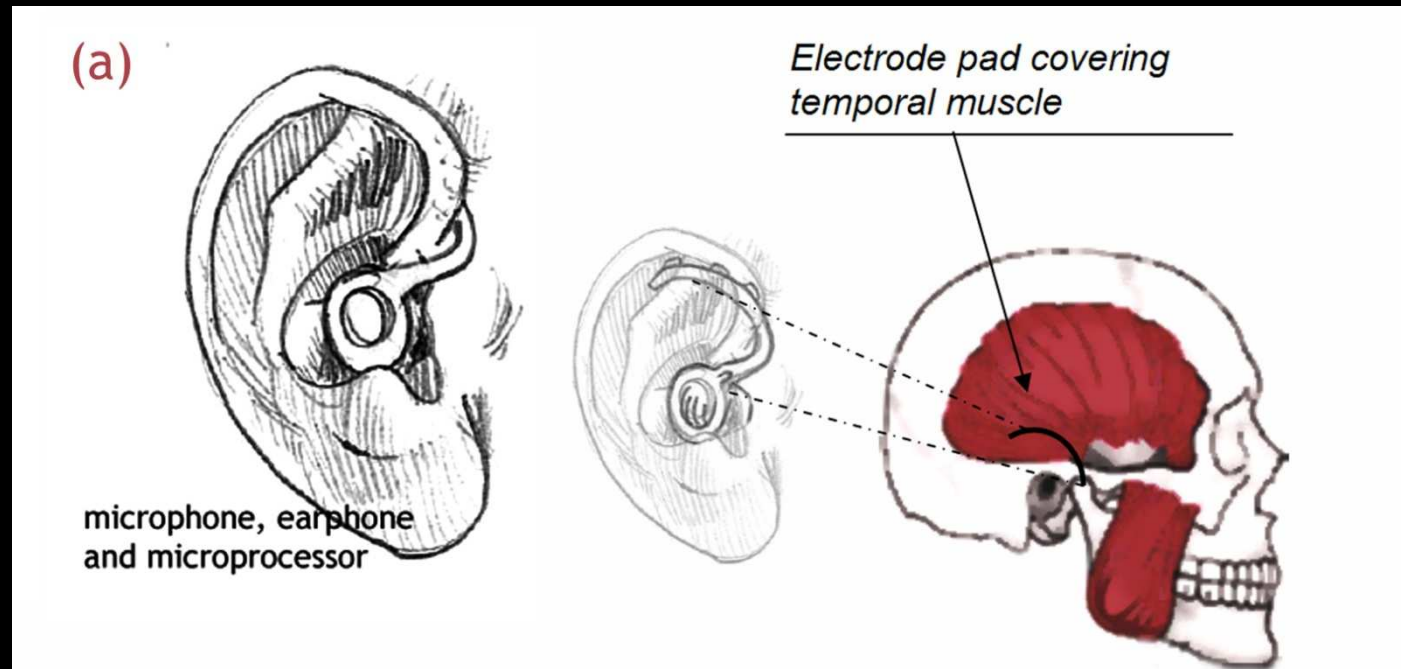


# EARLIDS

Alvaro Cassinelli (\*)

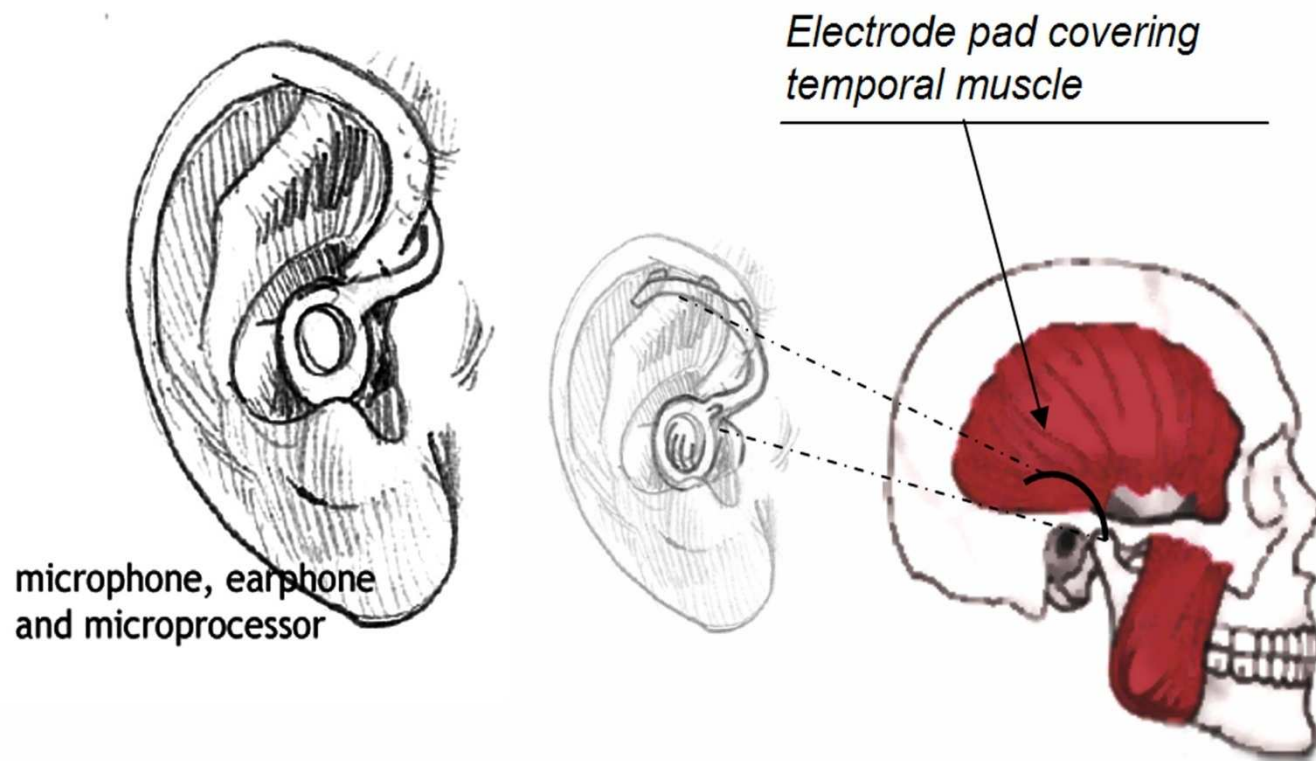
*Third Workshop on Devices that Alter Perception  
(DAP 2010) in conjunction with ISMAR 2010,  
October 13th, 2010, Seoul, South Korea*



(\*) *Assistant Professor / Meta Perception Group  
Department of Information Physics and Computing  
University of Tokyo*

Concept: 2006  
Prototype: 2010

*Voluntary control of auditory gain by voluntary contraction of mastication muscles...*



Reflex-reaction to harmful noise (including facial muscle contraction) has a natural effect on auditory gain – ***the proposed device seeks to amplify this effect.***

## Possible Applications:

### Protection:

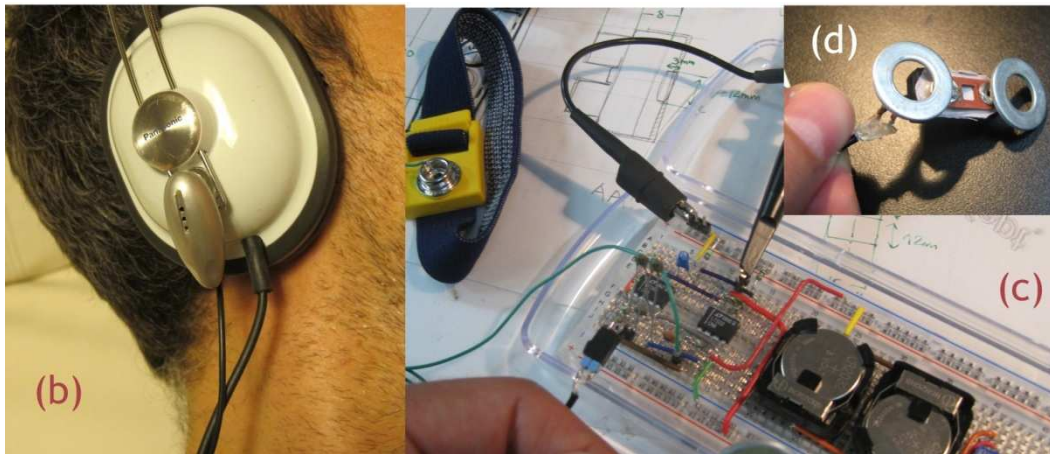
- useful for entering/leaving harmful noisy places (or standing momentary noisy environments) without having to use hands or earplugs.

### Augmented sensing:

- augmented dynamic range for human auditory perception (attenuation **and amplification also** – like hearing aids – when opening the mouth).
- new “ability” leading to a new form of hearing (conscious or unconscious; for instance modulation may be proportional to arousal, heart beat, etc): **entacoustic performance**

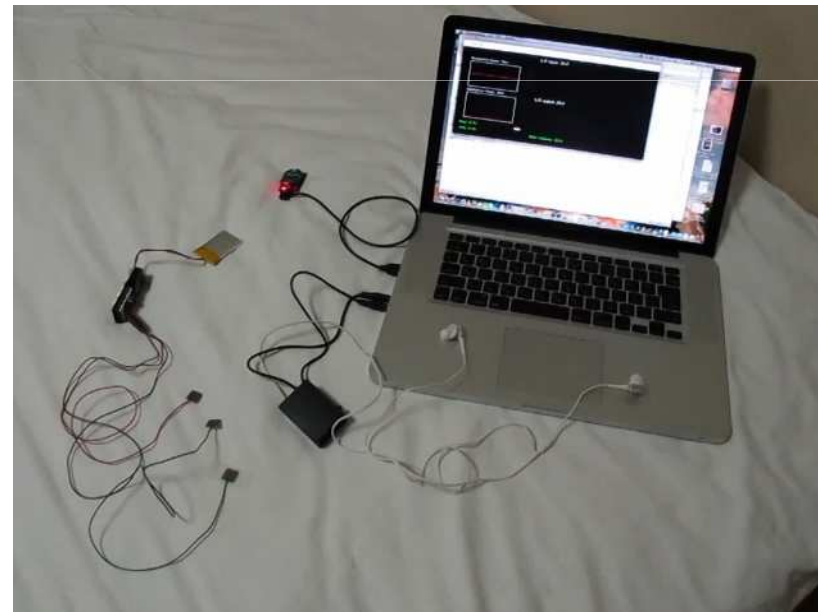
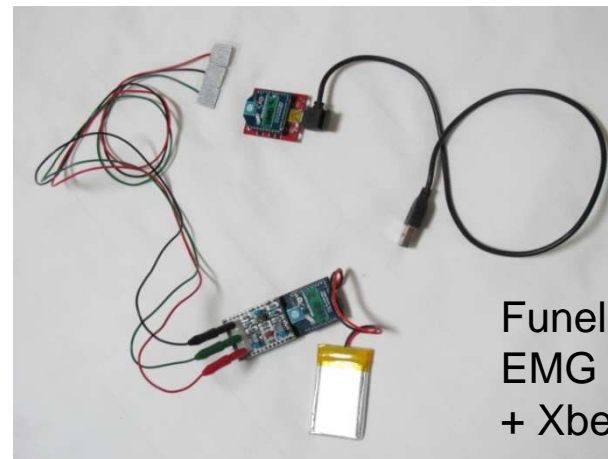
### Everyday life:

- voluntary, seamless control of gain on playback (portable music players, etc).



*all analog* early prototype  
(did not work well...)

## New *digital* prototype:

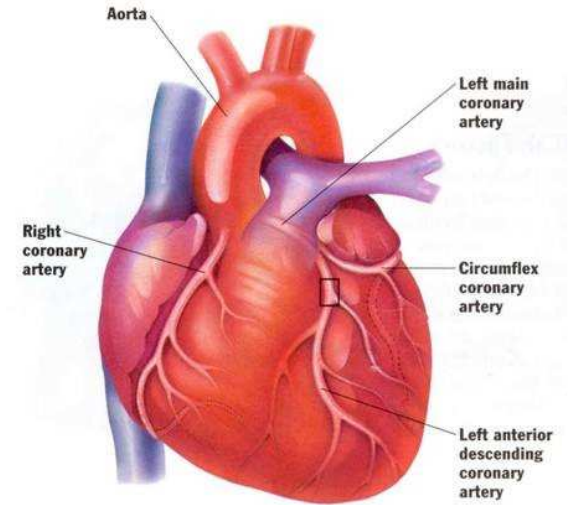


(\*) thanks to Daito Manabe for lending the hardware

**Demo sound modulation** (with pre-recorded sound so everybody can hear!)



# Modulating music with your heartbeat...



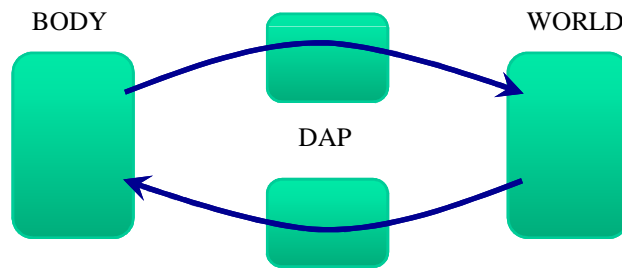
11. Concerto in D Major for Violin, Strings, and Continuo http://www.all-music-sheets.com

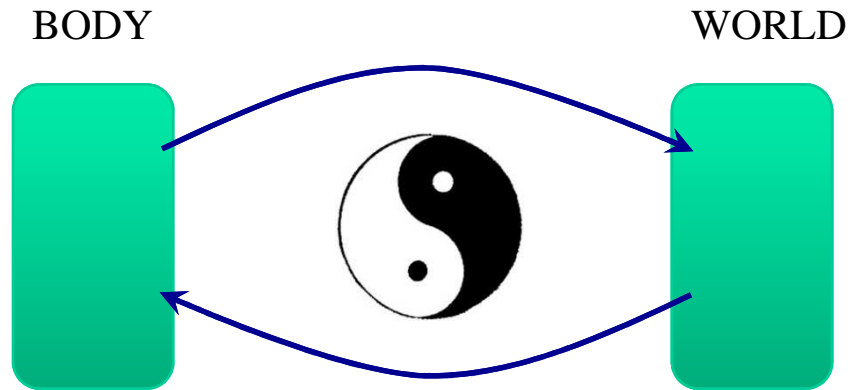
Allegro

A musical score for the first movement of a concerto in D major, marked Allegro. The score is written in treble clef with a key signature of two sharps (D major) and a common time signature. The music consists of several staves of notes and rests. Red heart icons are placed above the notes in several measures, indicating a modulation of the music based on the person's heartbeat. The score includes dynamic markings such as *p* (piano) and *f* (forte). The score is numbered with measure numbers: 6, 10, 15, 19, 24, 27, 30, 33, and 37.

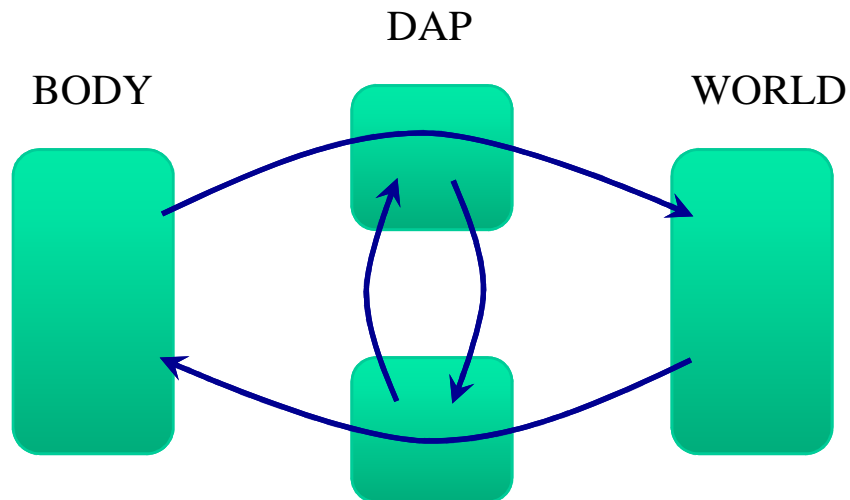
# DISCUSSION

DAPs in the light of the Action in Perception Theory





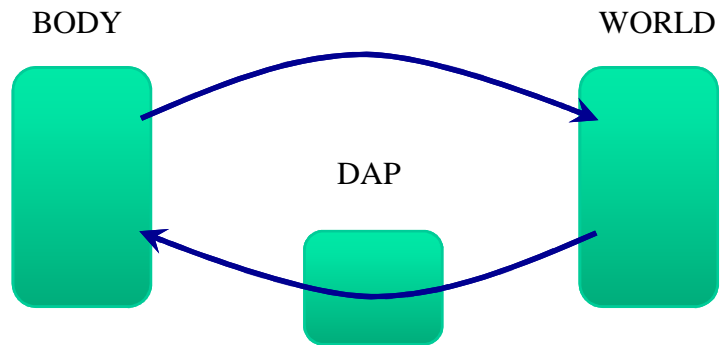
This intuitive/enactive knowledge of the functional interrelation between actions and sensed consequences is what we call **perception** (and at a higher level understanding)



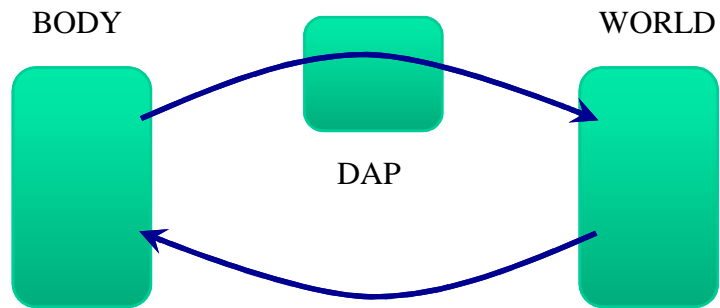
Devices that alter perception interfere the natural sensory-motor feedback, in order to create new “sensory-motor contingencies”



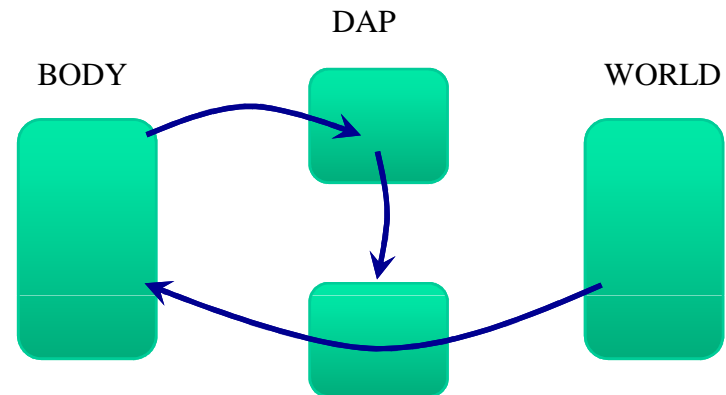




spectacles,  
(but also sensory  
substitution systems...)



Vocoder,  
(but also a *car*...)

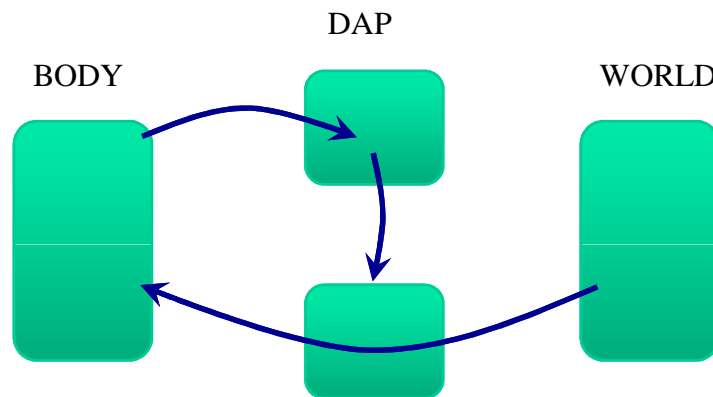


EARLIDS

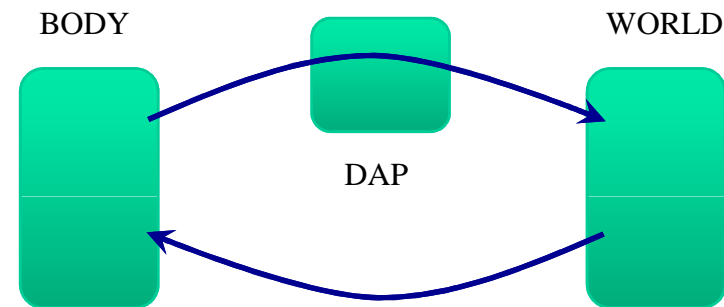
(\* Yes, a car: pressing lightly on the pedal, make us fly at high speed: isn't that a beautiful example of "altered action-perception"?)

**Earlids:** *amplification* of an otherwise subtle effect on auditory gain

**To Blink...:** *amplification* of disruptive effect of blinking



EARLIDS



TBNTB

Other forms of alteration are possible of course (artificial synesthesia, inverted goggles and inverted audio, etc), but I was interested here in **making the subjects aware of a process that remains invisible to themselves** because it is all too natural.

## Putting some order (idiosyncratic reflections!)

What happens **before** the subject masters the new sensory-motor contingencies?

- At first, the subject observe the consequences of actions without completely engaging with the world. **The device is just a “controller”** (ex: *I can use TBNTB to change the TV channels*). It is not yet a *functional part* of the user.
- As with the inverted goggles experiment, follows a phase of passive wonder (or fear), as **the world has become alien**.
- Cautious exploration of this “naked” reality; realization that there is more *to the eyes that meets the eye* (**time for reflection on meta cognition?**)
- Order slowly reappears; regain of conscious (but still not intuitive) control.

The experience facilitates deconstruction of the “old” senses in search of new meaningful experiences: **time for artistic or scientific exploration**

And what happens when the new sensory-motor skills are finally integrated?

- The subject may still be capable of decoupling the action from the percept: this leads to the use of such interfaces as controllers, but with improved skill (ex: piano player).
- Augmentation of the senses, emergence of new senses (and sensibilities), **X-men interfaces** and transhumans.

# Summary and Conclusion

What are DAP?

...devices that tamper with the SMCs!

For what purpose?

1. sensory substitution
2. sensory augmentation (improving or creating new senses)
3. can be used as controllers (but this is a by-product)
4. insights on the process of perception
5. help overcome blockages in personal perception (social, art, medical applications)

TBNTB:

3, 4 & 5

EARLIDS

2, 3, 4 & 5

How to design them? There are practical as well as ethical concerns