Perceptual Learning

- Perceptual learning is the specific and relatively permanent modification of perception and behavior following sensory experience. It encompasses parts of the learning process that are independent from conscious forms of learning and involve structural and/or functional changes in primary sensory cortices.
- Specificity refers to the fact that perceptual learning typically does not transfer across dissimilar sensory inputs. The improvement is very specific for the particular set of stimuli the subject has been exposed to.
Influences of multisensory experience on subsequent unisensory processing

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Sound Facilitates Visual Learning
(Seitz, Kim, & Shams, 2006)

**Experimental design**
- Report whether 1st or 2nd interval contains the coherent stimulus
- Then report the direction of motion
Sound Facilitates Visual Learning

- AVcong-trained group (blue) learned faster and to higher level than visual-only group (green)
- AVinc-trained group (red) did not show any advantage
Crossmodal Sensory Recalibration

The Rubber-Hand Phenomenon

- Seeing a synchronous tactile stimulation of a rubber-hand subsequently induces a shift in the proprioception of the hand in the direction of the seen rubber hand
Ventriloquist Aftereffect
(Lewald, 2002)

Experimental design

Results

Sensory adaptation/recalibration
- auditory localization shifted in the direction of visual cue (during adaptation)
- visual localization shifted in the direction of auditory cue (during adaptation)
Ventriloquist Aftereffect
(Wozny & Shams, 2011)

Interleaved multi-sensory and uni-sensory trials

Rapid establishment of auditory shift
- perceived auditory location shifted toward visual discrepancy in previous AV trial
- effect strongest when stimuli perceived to be same source than different source
Multisensory Associative Learning
(Wozny, Seitz & Shams, 2008)

- AV pairing facilitates visual detection (V1A1-V1)
- This facilitation is orientation-specific, and not an auditory alerting effect (V1A1-V2A1)
- Facilitation is not due to net amount of exposure (V1-V2A1)
- Although there is some transferring in auditory frequency (V1A1-V1A2), perhaps due to the closeness in frequency of the two auditory tones
- **However**, V1A1 is the only test condition also present in exposure phase, so could be due to a similarity of context effect
Multisensory Associative Learning

- Similar results as before
- V2 exposure did not benefit subsequent test trials
- Not a similarity in context effect, but a multisensory associative learning benefit
- Also a discrimination task, not a detection task as before, showing generality
Multisensory Learning/Adaptation

V processing not affected by A → Enhanced V processing in presence of A → Enhanced V processing even in absence of A

A V → Associative Learning → A V → Additional Exposure

Ecological validity necessary?
Discussion