

Attentional and motor development

IIE 366: Developmental Psychology
Greg Francis
Lecture 13

Chapter 5: Perceptual and Motor Development

Module 5.2 Attentional Processes

Module 5.3 Motor Development



Children and Their Development, 4/e by Robert Kail

Theoretical issues

- What is "attention"?

"Every one knows what attention is. It is the taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought. [...] It implies withdrawal from some things in order to deal effectively with others." (James, 1890/1950, pp. 404-5)

"Attention" is not well understood. So...

Theoretical issues

Why study *attentional development*?

1. As a set of processes in and of themselves, to address the following questions:

- Does attention develop through stages?
- Are changes in attentional performance better accounted for by quantitative vs. qualitative changes?
- Is it "innately" specified?

Theoretical issues

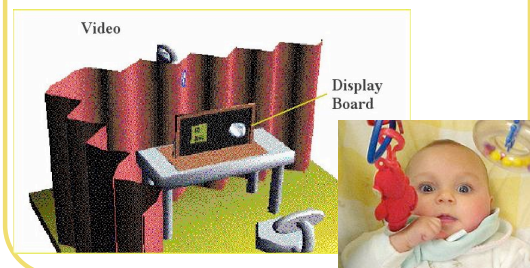
Why study *attentional development*?

2. As (one) source of developmental change across domains:

- Attention influences experience of multiple types (e.g., vision, audition)
- Could changes in attention account for some domain-specific developmental changes? (e.g., number, physics)

Early Visual Attention: Methods

- Changes in looking time or speed of orienting as a measure of attentional effects:



Attention: Maturation Accounts

Successive maturation of attentional processes (and pathways):

- Bronson (1974):
 - Exogenous = driven by the environment
 - vs. Endogenous processes = driven by internal representations
 - [Brain: Subcortical vs. cortical mechanisms]
- Atkinson (1984, 2000):
 - Exogenous vs. endogenous processes
 - [Brain: Subcortical and cortical mechanisms for 1. eye and head movement; 2. reaching and grasping]

Evidence for maturation: The newborn

Unlike later patterns of eye-movements (saccades), newborns produce:

- Saccadic pursuit tracking: step-like and lagging behind moving stimuli (Aslin, 1981)
- Preferential orienting to the temporal field under monocular viewing conditions (Braddick et al., 1992)

=> exogenously-driven processes [sub-cortical neural bases]

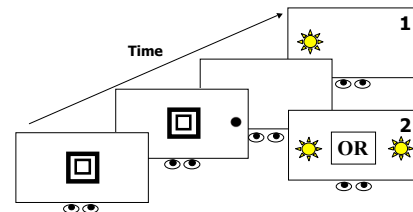
Evidence for maturation: 1 to 3-month-olds

In contrast, 1 to 3 month-olds exhibit:

- Onset of smooth pursuit tracking (Aslin, 1981)
- Increased sensitivity to nasally presented stimuli
- Obligatory attention ("sticky" fixation): slower in disengaging from central stimuli (Stechler & Latz, 1966; Hood & Atkinson, 1993)

Evidence for maturation: 3 to 4-month-olds

- Anticipatory saccades (Haith et al., 1988; Wentworth & Haith, 1998)
- Inhibition of automatic saccades (Johnson, 1995)



Infants decrease looking towards the cue only in 1.

Evidence for maturation: Through the 1st year

Gradual improvements:

- Faster facilitation towards peripherally-cued locations (Johnson & Tucker, 1996)



- Using central cues to direct attention (Johnson et al., 1991)
- Ability to withhold orienting towards locations (Gillmore & Johnson, 1995)

=> Driven by internal (endogenous) representations [more cortically-guided]

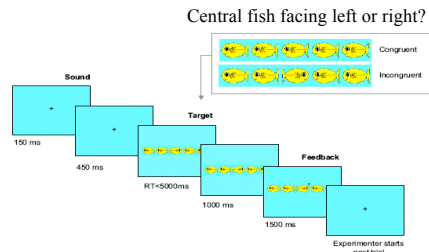
Maturation accounts: Limitations

- Onset of functioning is not all-or-none:
 - E.g., evidence of endogenous processing in newborns (pattern recognition, orientation discrimination, e.g. reviewed in Atkinson, 2000)
 - [Brain: Frontal cortices involved in perceptual processing early in development (electrophysiological markers, Csibra et al., 2000)]
- Prediction of sequences, rather than static ages of onset
- Dynamic interactions across processes are poorly understood

Beyond Infancy: What develops?

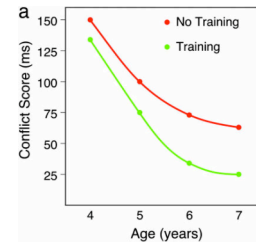
Are there later changes in attentional processes?

- Executive control (Rueda et al., 2005)



Beyond Infancy: What develops?

Evidence that training with these kinds of programs can help

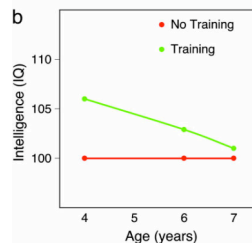


Beyond Infancy: What develops?

And this training affects other measures such as IQ

Notice, training only makes a difference for children younger than 7

Perhaps the relevant attentional systems are already developed by age 7



Beyond Infancy: What develops?

Are there later changes in attentional processes?

- Attentional capacity

- ♦ The task: Are "X" or "N" present in the centre (ignore peripheral irrelevant stim.)?

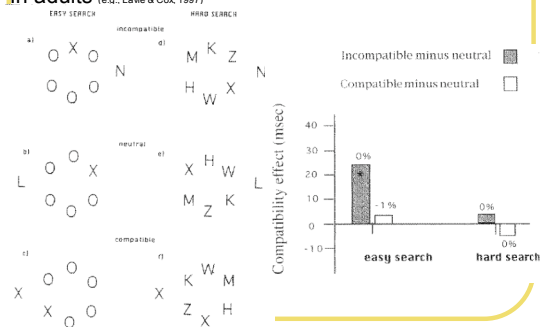
Low load: high interference from distractor that conflicts with target

High load: lower interference!



Beyond Infancy: What develops?

In adults (e.g., Lavie & Cox, 1997)



Beyond Infancy: What develops?

In adults:

Perceptual load of a visual display "uses up" available attentional capacity (Lavie, 1995, 2000):

- ♦ Low perceptual load: irrelevant peripheral stimuli cannot be ignored very easily
- ♦ High perceptual load: irrelevant peripheral stimuli are ignored

Beyond Infancy: What develops?

- Gradual changes in attentional capacity over development
 - Childhood: (Huang-Pollock et al. 2002)
 - At low load**, children's performance was poorer than adults (more affected by irrelevant distractors, due to poorer executive control)
 - At high load**, children's performance was as efficient as adults' (their attentional capacity was "taken up" by the central load),
- => **Gradual changes in both executive control and attentional capacity from childhood to adulthood**

Beyond Infancy: Summary

Beyond infancy, there are gradual changes in:

- Executive control
- Attentional capacity

Thoughts for consideration

- Can these be modified by training?
- Are they under genetic influences?
- How would they impact development in other domains?

Before Infancy: Preterm babies

- What about babies who are born prematurely?
- Do they have any attentional mechanisms?
- A study shows they do
 - 26 preterm infants
 - Gestation of 28 to 32 weeks (normal is 40 weeks)

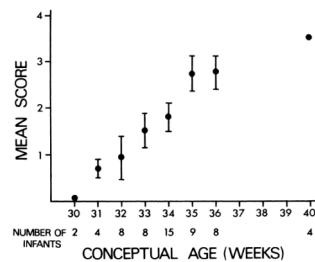


Before Infancy: Preterm babies

- To test, find a baby with its eyes open
- Put a poster board in front of the baby
 - With a pinhole so the experimenter can watch the baby
- Present a visual stimulus on either the left or right side
- After each presentation rate 0-4 on several scales
 - Ocular control: binocular coordination of the eyes
 - Aperture width: wide-eyed looking was a 4
 - Brightening: a change in the appearance of the eyes
 - Scanning: fine eye movements
 - Sucking: refusal to hold pacifier (0), interruption (4)

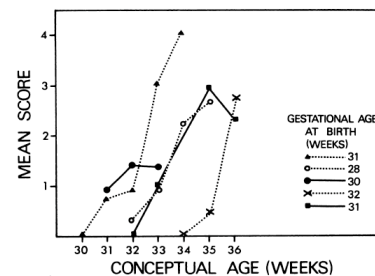
Before Infancy: Preterm babies

- Consistent increase with conceptual age
 - weeks since conception-not a term used much any more, but this study was in 1976



Before Infancy: Preterm babies

- Consistent increase for individual infants
 - Longitudinal study



5.2 Attention

- Attention improves with age
- We can help children be more attentive by
 - > reminding them to be attentive
 - > teaching strategies to be attentive
 - > removing distractions

5.2 Attention Deficit Hyperactivity Disorder

- Occurs more often in boys than girls
- Symptoms: inattention, hyperactivity, and impulsivity
- Biological and hereditary causes
- Drugs alone can treat ADHD
- Drugs combined with psychosocial treatment are best treatment for ADHD and accompanying problems

5.3 Motor Development

Locomotion
Fine-Motor Skills
Physical Fitness

5.3 Locomotion

- Walking alone occurs around the first birthday:
Culmination of a long developmental progression.

Motor Milestones

0 month: Fetal posture	1 month: Chin up	2 months: Chest up	3 months: Reach and miss
4 months: Sit with support	5 months: Sit on lap, grasp object	6-7 months: Sit alone	7-8 months: Stand with help
7-8 months: Crawl	8 months: Pull to stand by furniture	11 months: Stand alone	12 months: Walk alone

5.3: Locomotion

5.3 Locomotion

- Walking alone occurs around the first birthday
- *Dynamic Systems Theory*: motor development involves many distinct skills
- *Differentiation and integration* of component skills (posture and balance, stepping, perceptual skill) is necessary

5.3 Fine-Motor Skills

- Reaching and grasping become more coordinated throughout infancy
- Toddlers prefer to use one hand and this preference becomes stronger during the preschool years
- Heredity and culture influence handedness

5.3 Physical Fitness

- Most school children in US are not physically fit
- Many children engage in sedentary leisure activities (e.g., TV, computer games)
- Sports help children be physically fit, teach cognitive and social skills
- Coaches should be positive and have realistic expectations

Next time

- Review for exam
- Exam I
- Chapter 6, theories of development