

Constraints and Opportunities for Learning From Media during Early Childhood

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Television is the most frequent media format during early childhood

- Children < 8 years spent on average 1hr 40 min/day viewing TV
 - 72% of all screen time
 - Amount has remained constant
- TV format (DVR, streaming) and viewing devices (tablets, tv set, smartphones) have expanded rapidly
- ~30 min/day difference in usage as a function of parental education and income



Mobile device usage starts young

- Virtually all homes have a tablet or smartphone (98%).
- Usage has increased. In 2013 38% of those under 8 had used a mobile device and now 84% of those under 8.
- Under age 2, 46% have ever used a mobile device
- < 2s only 5 min/ day to 21 min/day in 5-8 year olds on mobile devices



Content Matters



Context Matters



Can they learn from different types of media?



Transfer of Learning

- Adaptive skill
- Transfer info across content & context
 - Day-to-day functioning
 - Central to memory theories → development of a flexible representational system

(Barnett & Ceci, 2002; Hayne, 2006)

Learning from TV, books, touchscreens

- Involves transfer of learning across content & context
 - is almost effortless by adulthood (e.g. tv cooking show → meal)
 - cognitively challenging during early childhood



(Barnett & Ceci, 2002; Barr, 2010, 2013; Hayne, 2006)

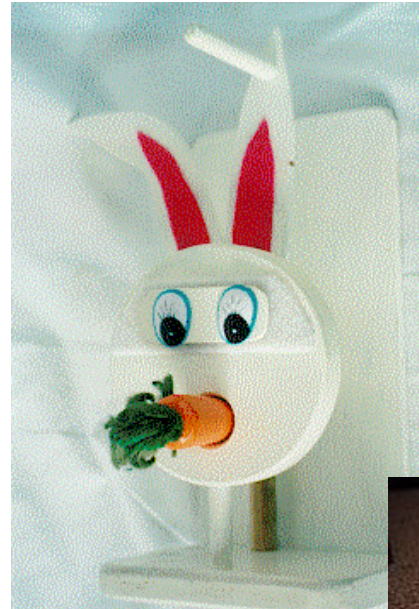
Transfer of Learning

- Young children consistently learn less from TV and touchscreens than from a live demonstration because it is difficult to understand how information from the screen relates to the real world = the transfer deficit. (For review see Anderson & Pempek, 2005; Barr, 2010,2013)
- Transfer deficit can be overcome by considering the 3C's (Guernsey, 2012), how the child learns and the content and the context of that learning. (Barr, 2013, Barnett & Ceci, 2002; Hayne, 2006)



Barr and Hayne, 1999

- Age
 - 12-, 15-, 18-month-olds
- Manipulation
 - live 3x model, video 3x model, or control group.
- Delay
 - 24 hours



Experimental Set-up



Infant behaviors



Behavior 1

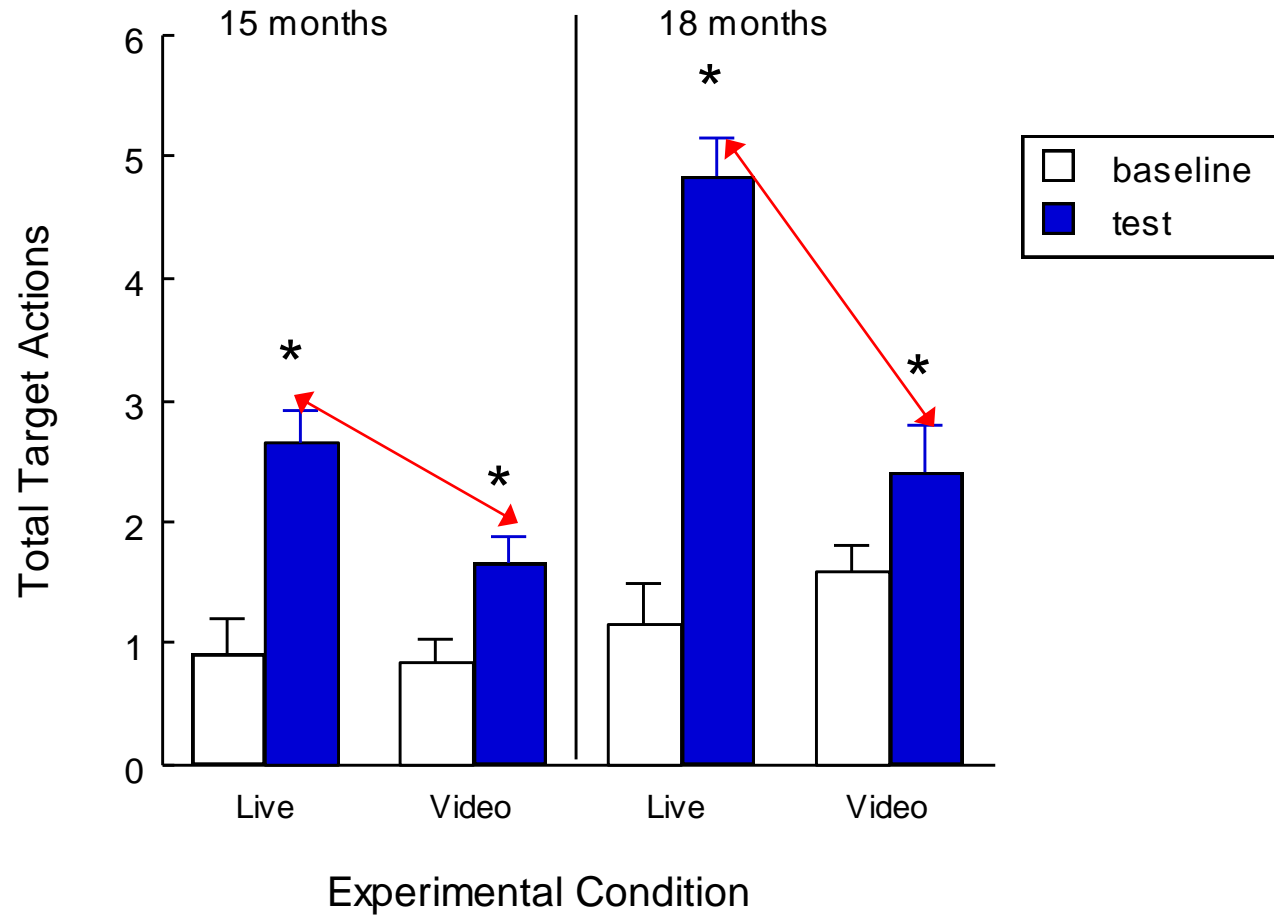


Behavior 2



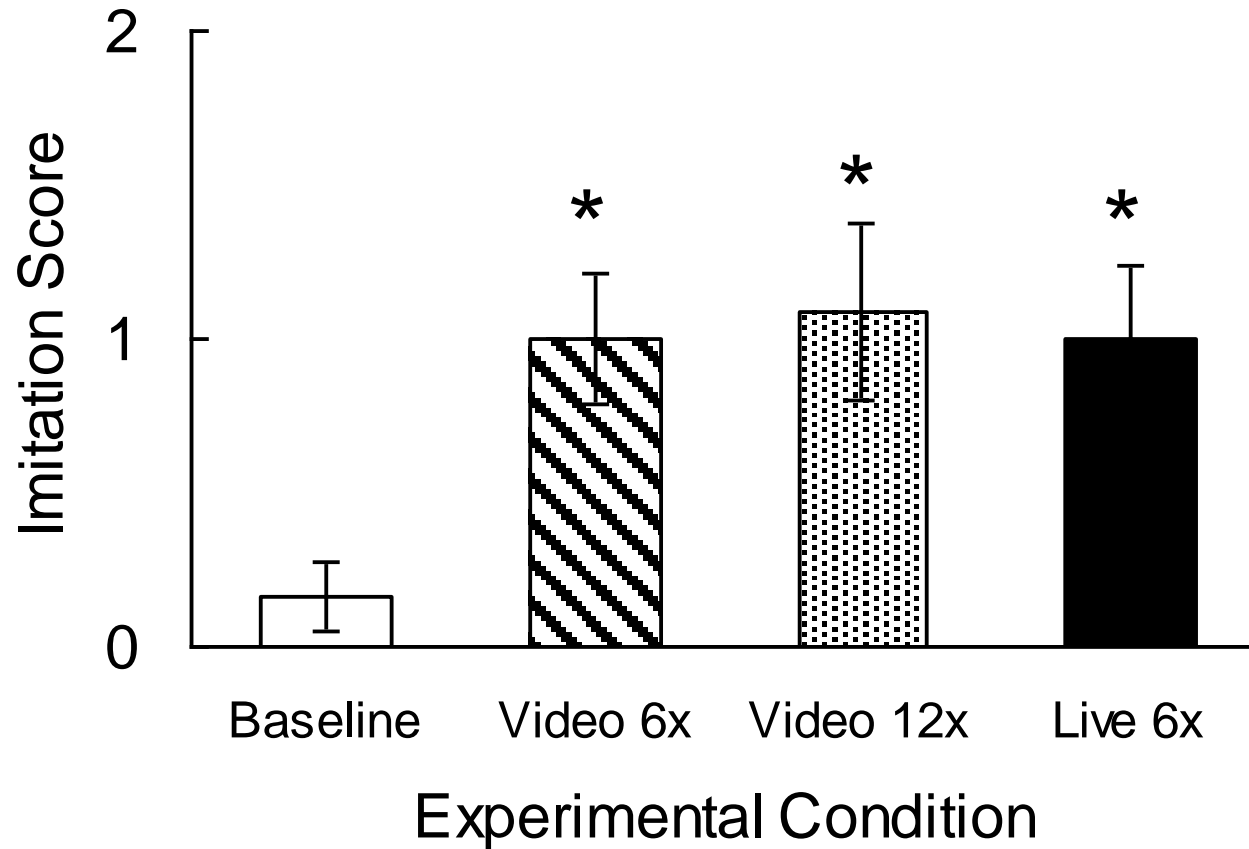
Behavior 3

Transfer Deficit





Infants as young as 6 months can learn from TV



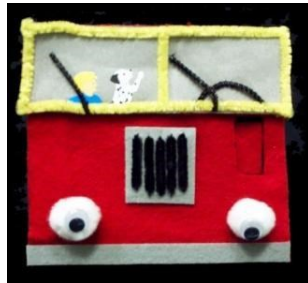
Touch Screen Imitation Task

- Establish touch screen deferred imitation procedure to examine transfer between 2D and 3D
- Hypothesize that transfer (e.g., 2D to 3D or 3D to 2D) will be more difficult than no transfer (e.g. 2D to 2D)
 - because fewer retrieval cues at test that match encoding conditions

Whether we use a Button Box Test with 15 month olds



Bus Button Box



Firetruck Button Box



Duck Button Box



Cow Button Box



- Baseline
 - 3D
 - 2D
- Within Dimension
 - 3D to 3D
 - 2D to 2D
- Cross Dimension
 - 3D to 2D
 - 2D to 3D

Demonstration Phase



3D Box
Demonstration

OR



2D Touchscreen
Demonstration

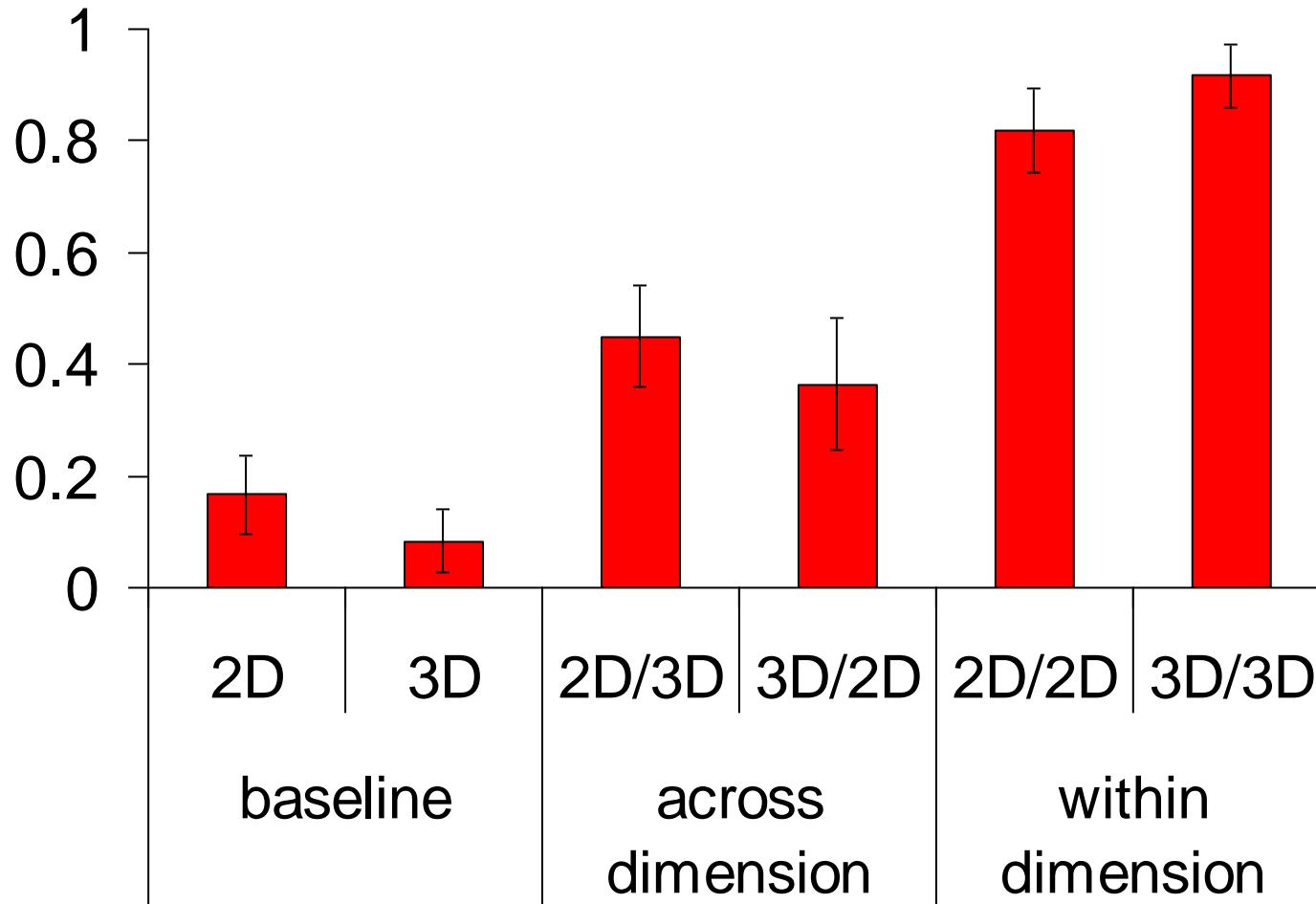
Test Phase

3D Box Test OR 2D Touchscreen Test

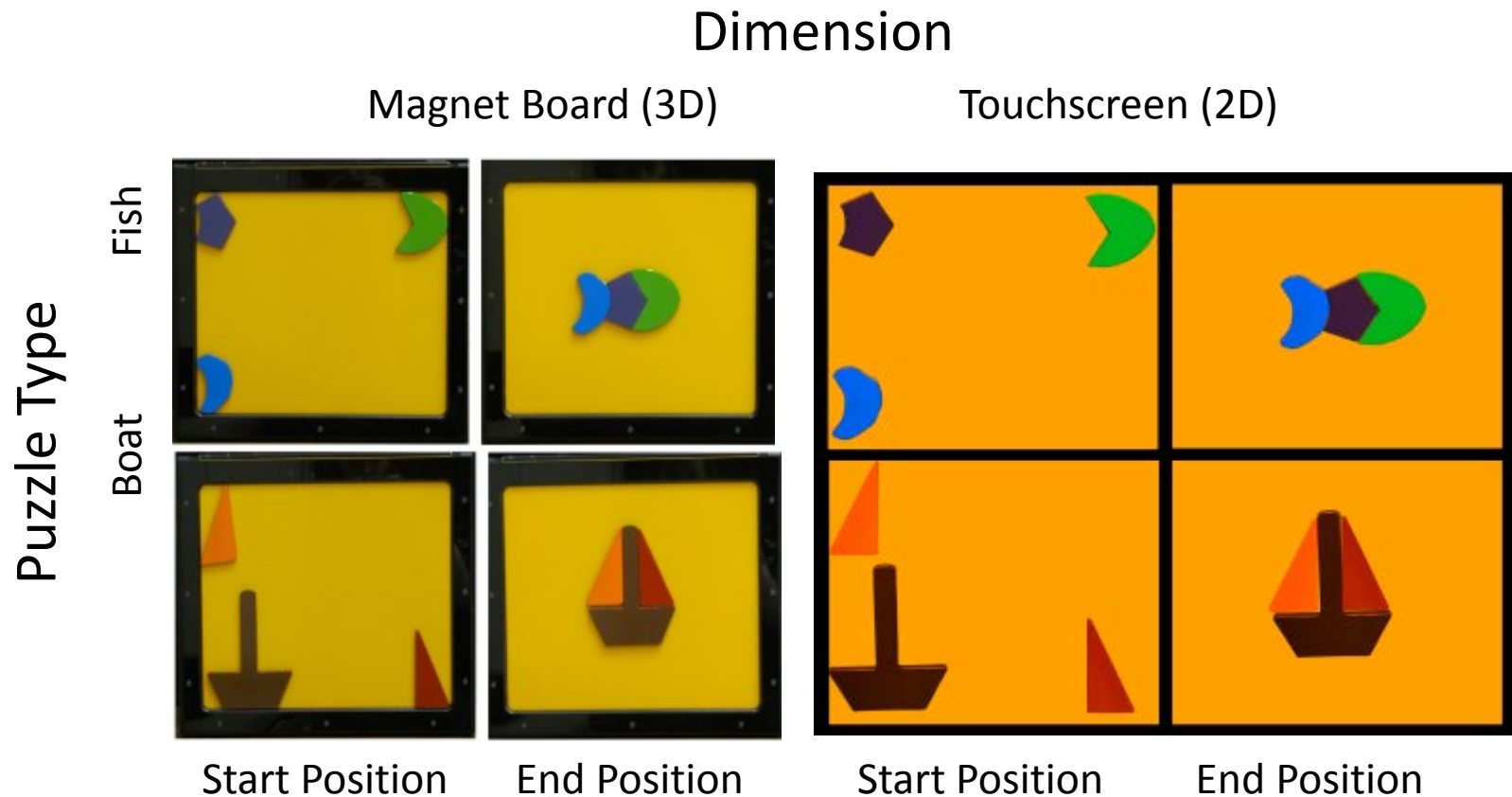


15-month-olds

Results: Transfer deficit



Or a Puzzle Imitation Paradigm with 2.5 & 3-year-olds



Magnet Board/Touch Screen



Touchscreen



Transition



Magnet Board

Demonstration Phase



2D Touchscreen
Demonstration



3D
Demonstration

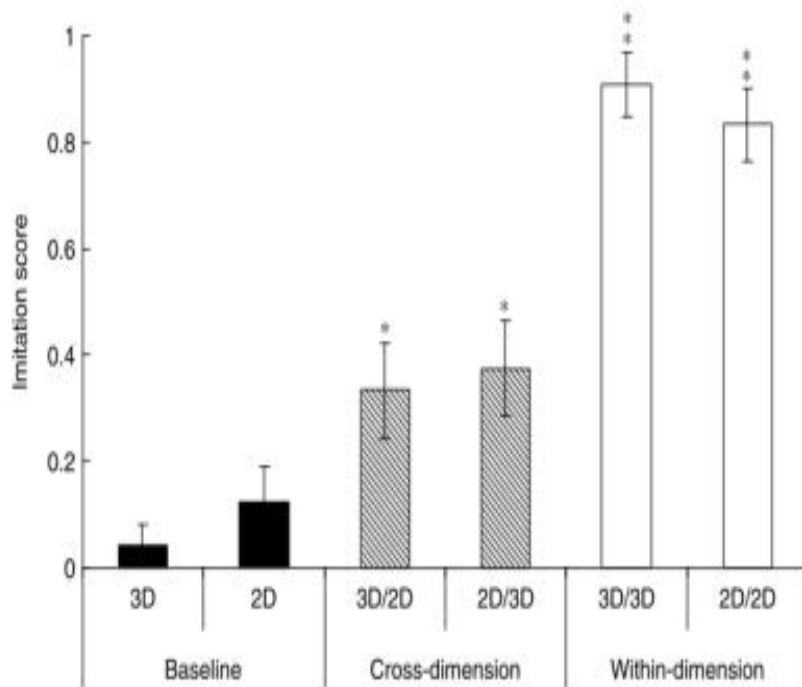
Test Phase



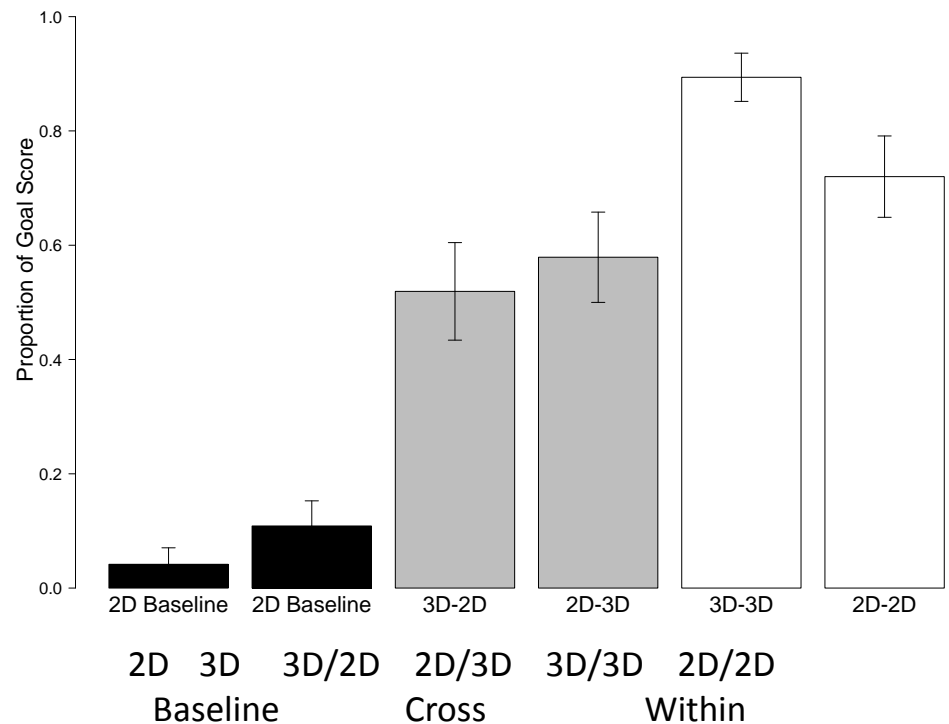
2D Touchscreen Test OR 3D Test

Crossing Dimensions is Difficult

Dimensional Transfer in 30 and 36-month-olds



15 month olds
(Zack et al, 2009)



2.5 & 3 year olds
(Zimmermann et al., 2016)

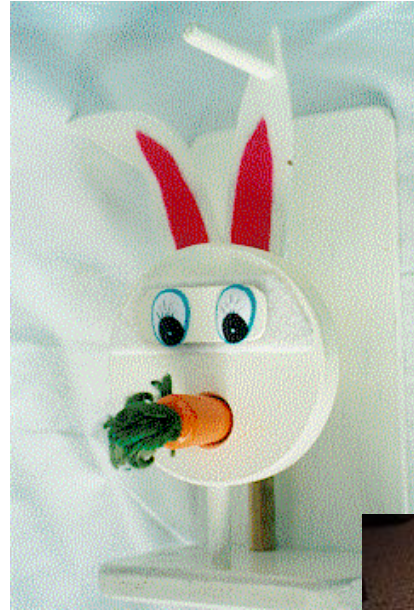
Conclusions

- Children can learn from television as young as 6 months of age.
- Children can learn to perform new actions on touchscreens
- Transfer across dimensions (3D-2D or 2D-3D) is challenging from 1 year to 3 years of life due to cognitive flexibility limitations
- Very similar patterns of learning from video and touchscreen.

Amelioration of Transfer Deficit

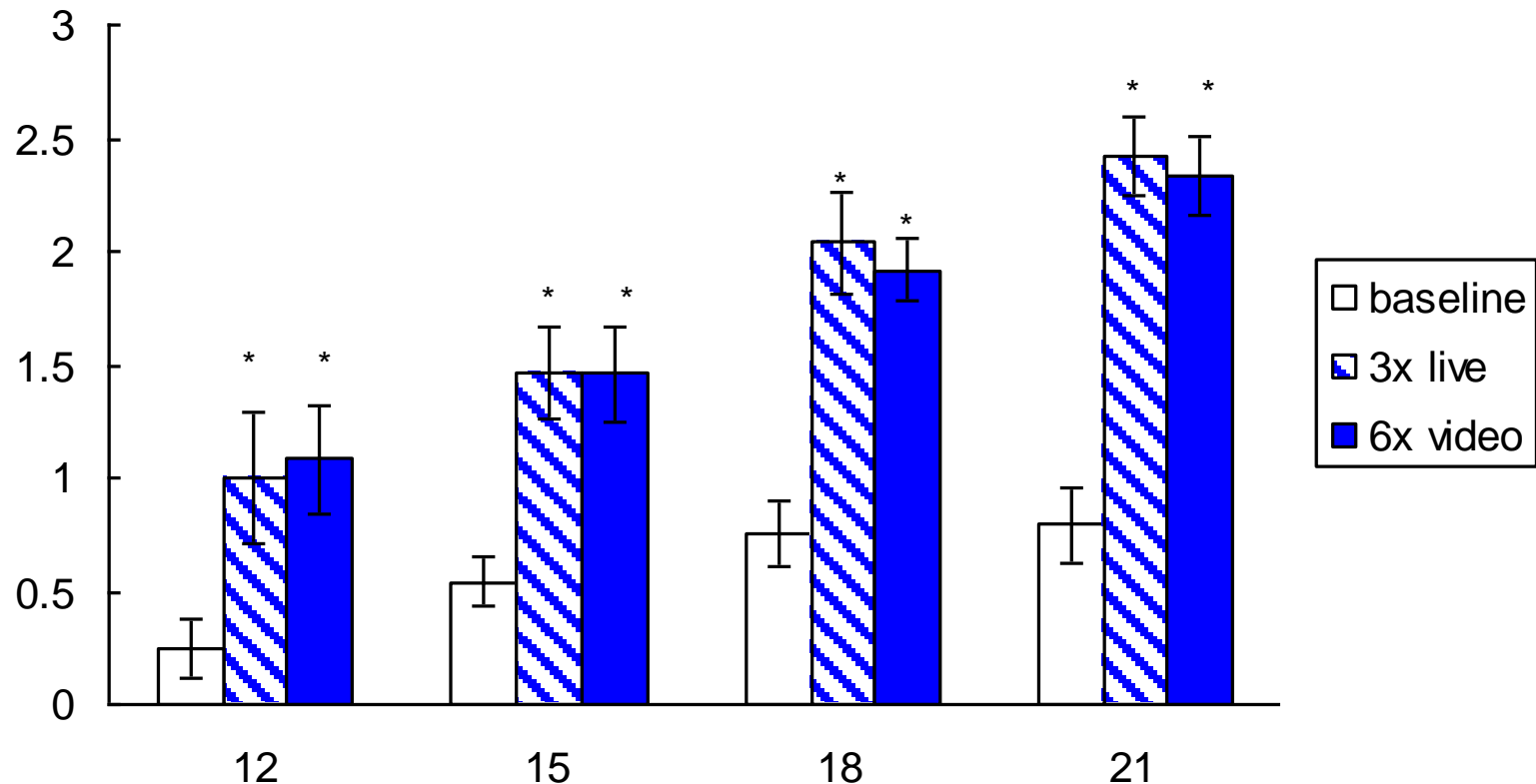
Television repetition effects

- Age
 - 12-, 15-, 18-, and 21-month-olds
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Amelioration of Transfer Deficit

Television repetition effects

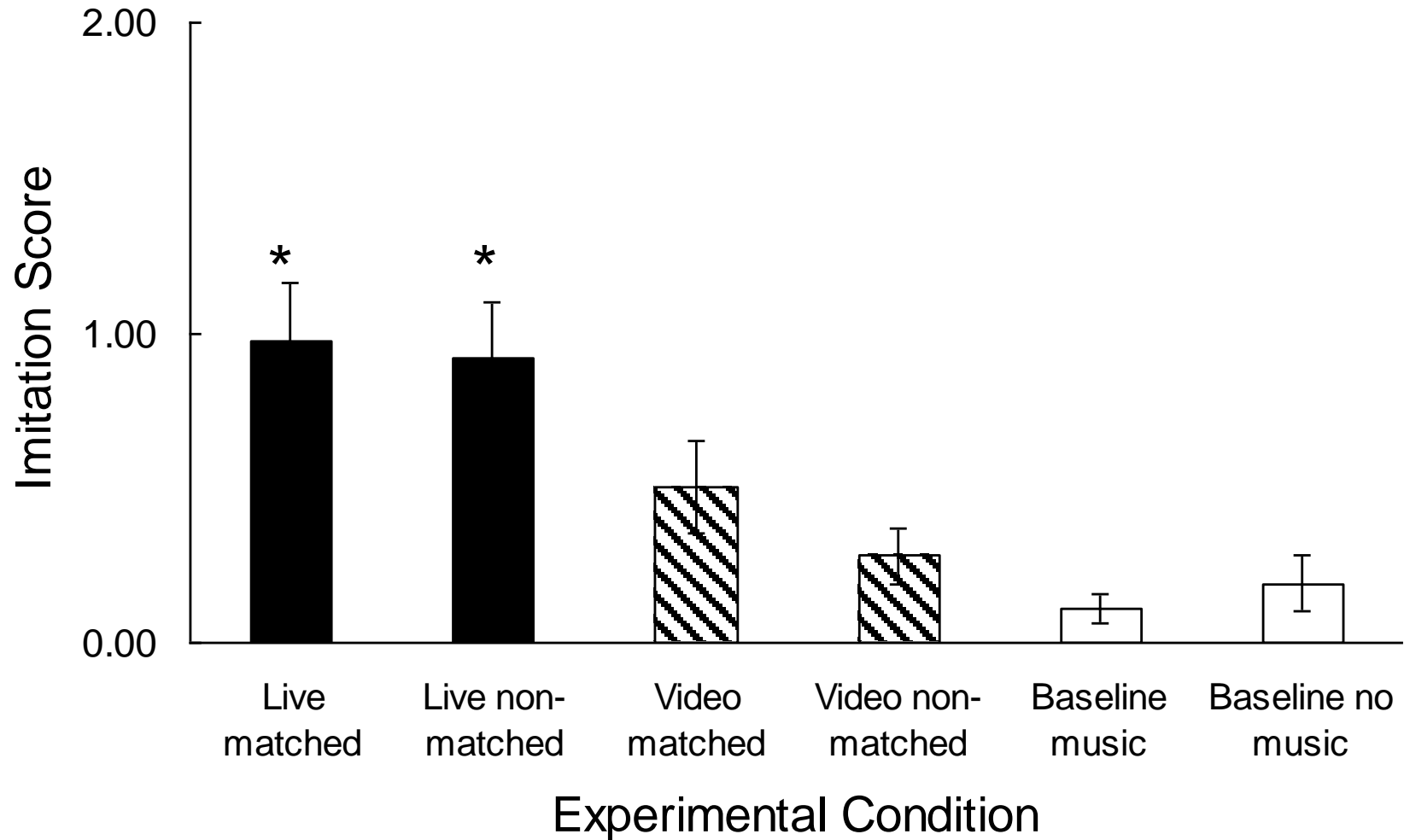


Exacerbation of transfer deficit

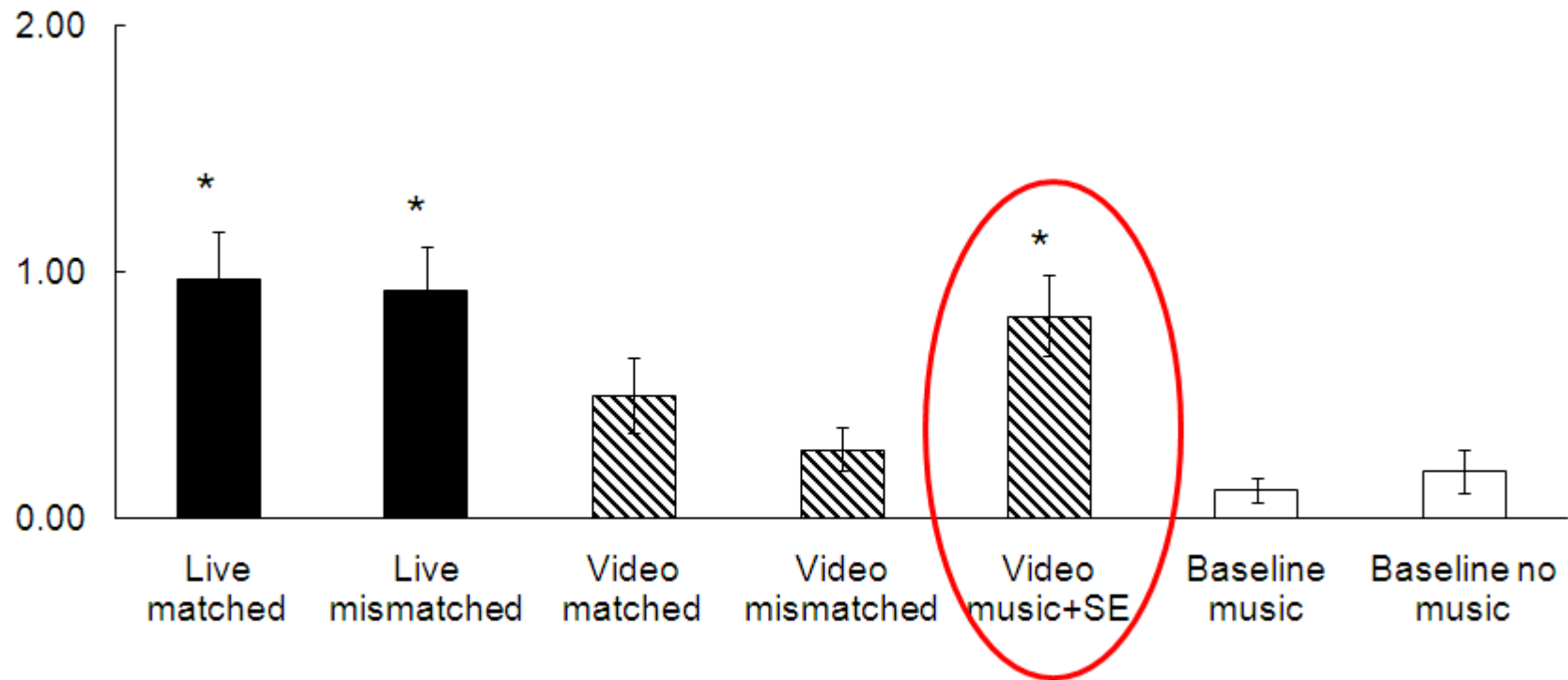
Background Music

- Cognitive overload happens easily
 - Music during video processing
- Learning from media easily disrupted during infancy

Music to live demonstration



Amelioration of Transfer Deficit Music + Sound Effects



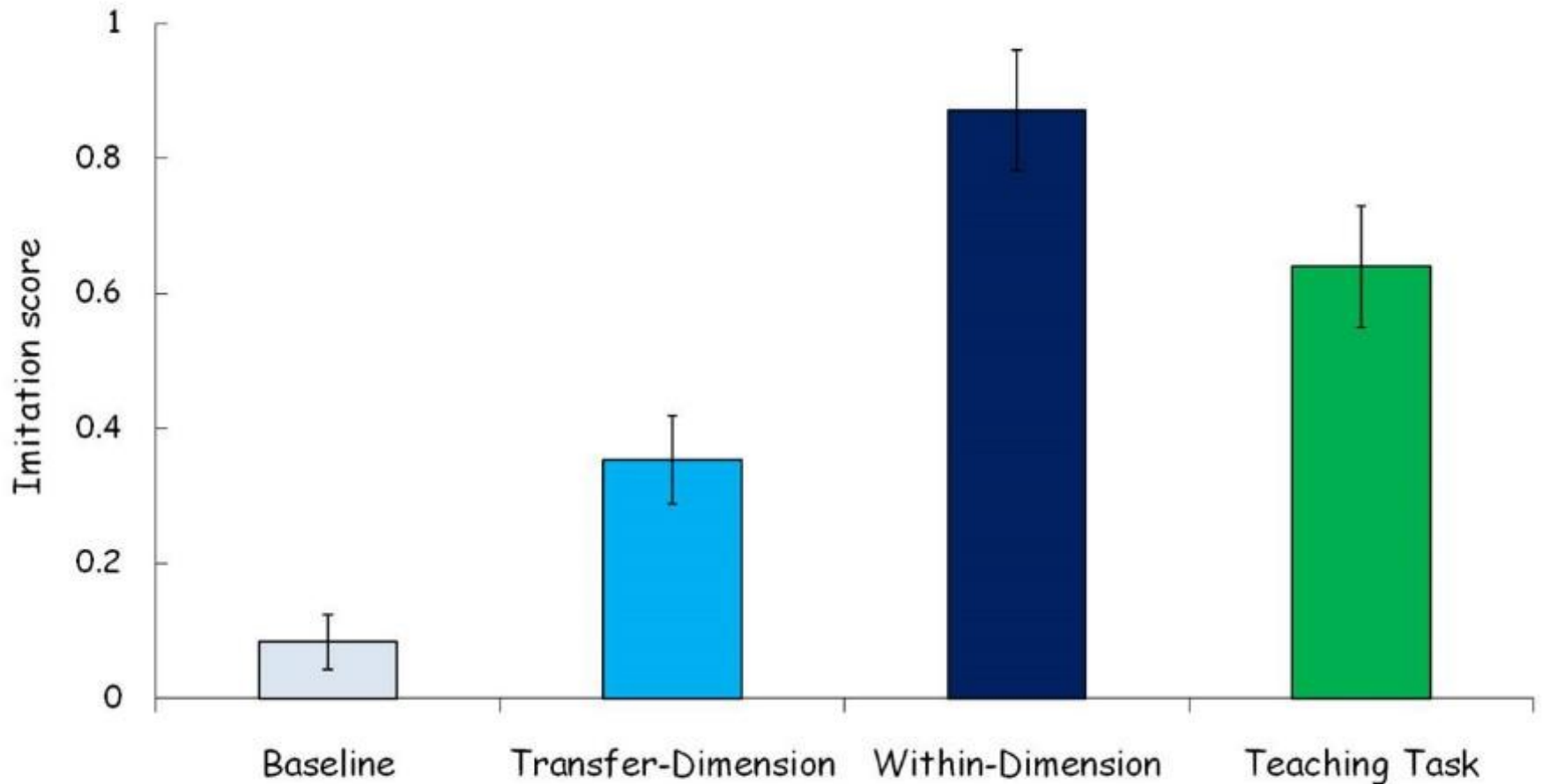
Opportunity: Social Mediation of Viewing

- Master skill in supportive social context
 - Skill internalized
 - Apply skill in new contexts
- Parents mediate looking patterns
 - Direct child's attention to specific content
- More parent scaffolding should =
↑ attention & learning from TV

Opportunity: Social Cues Matter: Parental Scaffolding



Results – Transfer Success



Parental Scaffolding Quality

- Parental scaffolding defined
 - Elaborate verbal input
 - Emotional support, warmth and responsiveness
 - Structured teaching



Structure of maternal input

- Varied verbal input or repeated info
- Maternal reminiscing
 - Elaborative vs. repetitive mothers
 - Memory development, narrative skills, & story comprehension

Proportion of “new” info

Diverse

What does a cow say?	N
Moo	N
And there's another cow	N
Look (child's name)	N
This is how I make him go moo	N
And look - 1 cow, 2 cows	N
I know, it's so funny	N
Can we make him go moo?	N

Repetitive

Look at this	N
Look at that	R
Look at that	R
It's a screen	N
Doesn't that look like the other toy?	N
Doesn't it look like the other toy?	R
It's yellow	N
Looks like the other toy, doesn't it?	R

Success associated with quality of parental scaffolding



- High parental scaffolding associated with 19x fold increase in the rate of transfer of learning

Parenting scaffolding

- Provides a warm and receptive context in a challenging learning task
- Provides a set of individualized language and joint visual attention cues to connect 2D and 3D information for child
- Context of media exposure may contribute as much as program content to any early learning from television

Cognitive constraints
e.g., developmental
changes in memory
flexibility



Context and caregiver:
Social factors
e.g., Contingent
interactions



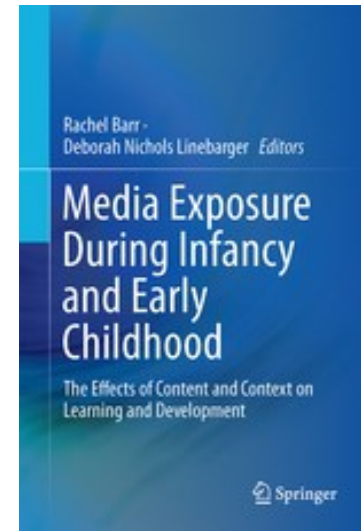
Content
Perceptual differences
e.g., degree of change
between 2D and 3D

Conclusions

- Learning is from 2D is
 - Cognitively demanding and complex task
 - Cognitive overload occurs easily
- Child
 - Transfer deficit from books, TV and touchscreens
 - Repetition and language cues help
- Content
 - Formal features processing differs as a function of age
 - Features can be added to enhance learning
- Context
 - Implication: scaffolding may be particularly important during early childhood.

Acknowledgements

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- www.zerotothree.org/resources/series/screen-sensesetting-the-record-straight





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