

Introduction

Emotion and Memory

- Emotional events tend to be remembered better than non-emotional events (for reviews see Christianson, 1992; Ochsner & Schacter, 2003)
 - Emotion has been divided along two orthogonal dimensions: valence and arousal, with emotional stimuli high in arousal having a larger effect on subsequent memory than stimuli with high valence (Kensinger & Corkin, 2003)
- Improved memory for emotional stimuli over neutral stimuli may be attributable to preferential processing (Dolcos & Cabeza, 2002), greater recruitment of distributed brain regions (Canli et al., 2000), and/or the automatic capture of attention (Calvo et al., 2007)
- Emotional information tends to produce a heightened recollection response compared to neutral information but does not have that same effect on familiarity (Ochsner, 2000)

Development of Memory

- Familiarity and recollection show separate developmental trajectories across childhood and adolescence, with recollection taking longer to fully mature (Ghetti & Angelini, 2008)
- The protracted development of recollection may influence how emotional information is processed during childhood and adolescence

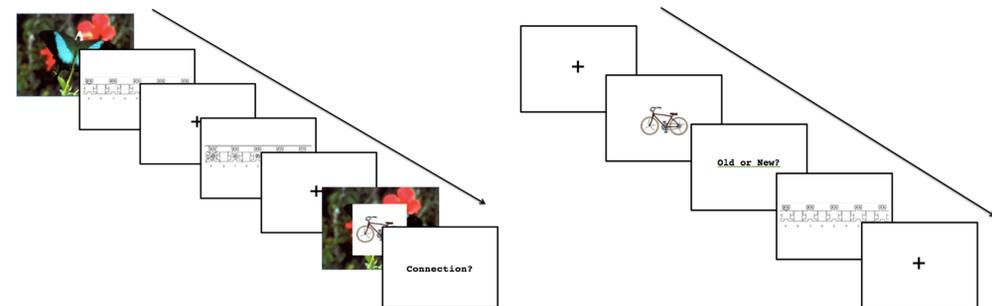
Present Study

- The present study examined how associated emotional content influences the episodic memory of neutral items in children, adolescents, and adults

Methods

Participants

- 30 children ($M=8.3$ years, $SD=0.42$, range 7-9 years old)
- 30 adolescents ($M=12.7$ years, $SD=0.55$, range 11-13 years old)
- 29 adults ($M=21.8$ years, $SD=5.02$, range 18-43 years old)



Encoding

Participants saw 60 IAPS pictures (source pictures) paired with 60 neutral images (item pictures). They rated each IAPS on valence and arousal and made a connection between the paired images

Delay

5 minutes, filled with either snack break or filling out forms

Retrieval

Participants saw 60 old and 20 new neutral item pictures. Item and source memory for both the IAPS source picture and source valence were assessed.

Hypotheses

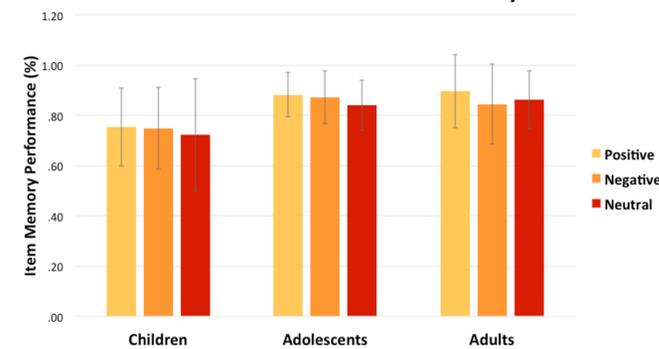
- Regardless of age, emotional source pictures and item pictures paired with emotional items will be better remembered than neutral source pictures and item pictures paired with neutral source pictures
- Regardless of emotional linkage, memory accuracy will increase with age
- Emotional stimuli high in arousal will have a larger effect on subsequent memory than emotional stimuli with high valence
- Exploratory research question: If and how the influence of valence and arousal will vary across age groups

Results: Valence

Analyses

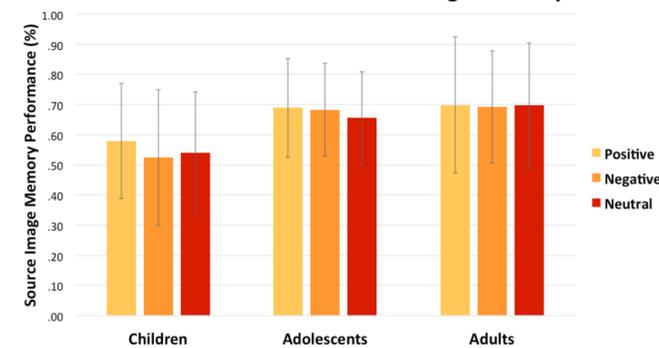
- Valence ratings were grouped into 3 categories: negative (1-4), neutral (5), and positive (6-9)
- Arousal ratings were grouped into 2 categories: low (1-4) and high (5-9)
- A repeated measures ANOVA was conducted in order to compare 1) item memory, 2) source memory for the IAPS picture, and 3) source memory for the valence of the IAPS picture (i.e., source valence) across the three age groups

Effects of Valence on Item Memory



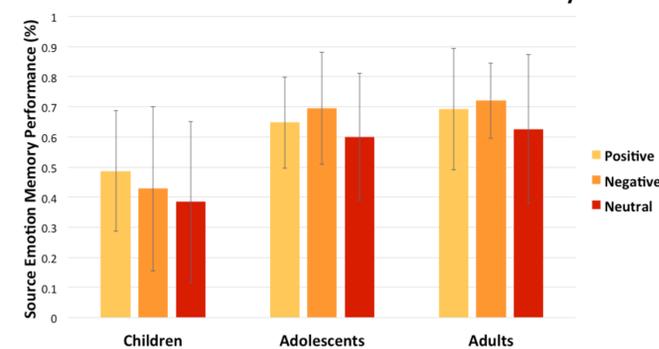
All age groups showed (slightly) better item memory for positive pictures than neutral pictures. There was no difference between negative and neutral or negative and positive pictures, $F(2, 170) = 2.88, p = .06$

Effects of Valence on Source Image Memory



There was no effect of valence on source image memory across all age groups

Effects of Valence on Source Emotion Memory



All age groups showed better source memory for the original valence rating of positive and negative pictures compared to neutral pictures, $F(2, 166) = 5.06, p = .01$

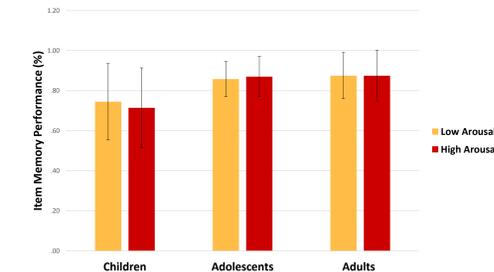
**Error Bars on graphs are based off of Standard Deviation

Results: Arousal

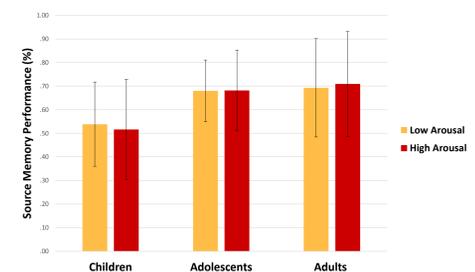
Analyses

- We examined the effects of arousal on item and source memory and found no significant results.

Effects of Arousal on Item Memory



Effects of Arousal on Source Memory



Discussion

- All ages exhibited a marginal effect of valence on item memory, in which positive pictures were remembered better than neutral pictures.
- All ages also showed a significant effect of valence on source emotion memory, in which participants recalled their original valence rating for positive and negative pictures better than for neutral pictures.
- This suggests that the effect of emotion is in place by 8 years of age and is relatively stable over time.
- Additionally, adolescents and adults showed better memory for all pictures than children, regardless of the background picture with which the neutral item was paired. This effect is consistent with previous research documenting memory improvements with age.

Future Directions

- In the future, studies should include samples of children younger than 8 years to better determine the age of onset of the emotion effect
- Future research should also explore how developmental changes in recall of emotional content are associated with on-going functional and structural maturation of the brain, as engagement of different neural regions is known to contribute to effects of emotion on memory

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