Divergent thinking and constructing future events: Dissociating old from new ideas

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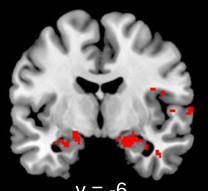
Introduction

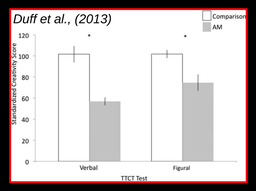
- Episodic memory contributes to aspects of creative thinking, specifically divergent thinking (i.e., the ability to generate creative ideas by combining diverse types of information.
- For example, amnesic patients with bilateral hippocampal damage, who exhibit impairments of episodic memory, also exhibit impairments on tests of divergent thinking such as the Torrance Tests of Creative Thinking (TTCT; Duff et al., 2013)
- Neuroimaging studies have also shown that episodic memory -related regions, such as the hippocampus, are recruited during divergent thinking and other forms of autobiographical thinking (e.g., future imagining/episodic simulation; e.g., Beaty et al., 2018)
- Addis et al., (2016) found that performance on the Alternate Uses Task (AUT), a test of divergent thinking, is positively correlated with the amount of episodic/internal detail (measured via the Autobiographical Interview, AI; Levine et al., 2002) comprising imagined scenarios that might occur in the personal futures (i.e., future simulation)

Memory + Simulation + Divergent thinking



y = -6

Beaty et al., (2018)



Addis et al., (2016)	Correlation with AI internal detail scores		
AUT Score	Future Simulation	Past Simulation	Past Recall
Fluency	0.40**	0.23	0.10
Flexibility	0.39**	0.22	0.11
Originiality	0.29*	0.21	0.02
Appropriateness	0.41***	0.25	0.11
Elaboration	0.37**	0.30*	0.26

****p < 0.001, **p < 0.01, *p < 0.05*

Current Aim

- In the current study, we examined whether divergent thinking is differentially associated with the ability to construct **novel imagined future events** (‘simulation’) and **recast future events** (i.e., actual past events recast as future events, ‘recast’) as opposed to **recalled past events** (‘recall’)
- We also examined whether different types of creative ideas (i.e., ‘old ideas’ from memory or ‘new ideas’ from imagination) underlie the linkage between divergent thinking and various types of autobiographical events.

Methods

- N = 36 (Addis et al., 2016)
- Two-Session study
- **Session 1**: Generated 35 episodic memories specific in time place each with a specific location, person and object (details used as cues in Session 2 episodic tasks)
- **Session 2**: Completed the AUT, followed by three episodic/autobiographical tasks
  - **AUT:** ‘Generate as many uses as possible’ for cues (eyeglasses, shoes, keys, button, wooden pencil, automobile tire)
  - Each cue presented for 1 minute; **old/new** status of ideas assessed post-task
  - **3 Episodic tasks** (counterbalanced order):
    1) Past-Recall (cues: original details; ‘recall past event’)
    2) Future-Imagine/Simulation (cues: recombined details, ‘imagine novel future episode’)
    3) Future-Recast (cues: original details, ‘using the same details associated with this memory, imagine what it would be like if the same event were to occur in the next few years’)
  - Details presented for 3 minutes
  - Collect vividness and difficulty after each trial

Analysis

- Episodic tasks: quantified internal/episodic and external/non-episodic details (in accordance with the Autobiographical Interview, AI; Levine et al., 2002)
- AUT: quantified AUT/divergent thinking measures (i.e., fluency, flexibility, originality, appropriateness, elaboration) separately for old and new ideas
- Ran across-participant correlations between the internal details quantified for each of the thee episodic tasks with the mean divergent thinking measures for old and new ideas
- Ran analyses ignoring old/new status of ideas in order replicate Addis et al. (2016)

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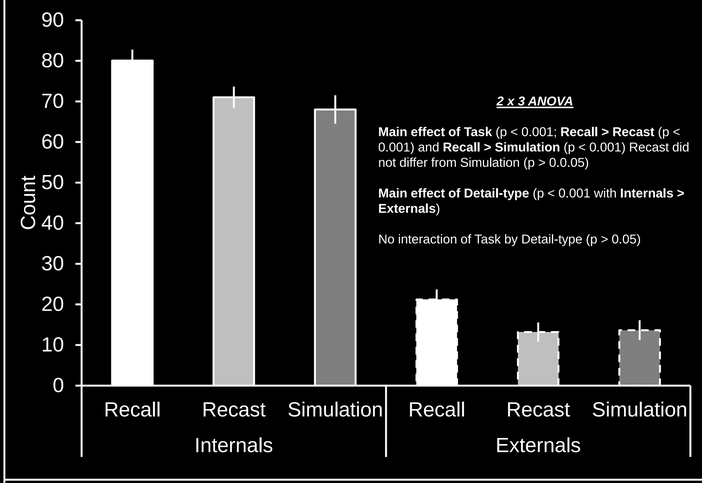
Results

Autobiographical Task Differences

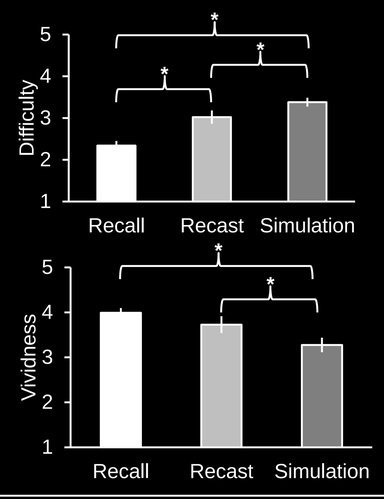


2 x 3 ANOVA

Main effect of Task ($p < 0.001$; **Recall > Recast** ($p < 0.001$) and **Recall > Simulation** ($p < 0.001$) Recast did not differ from Simulation ($p > 0.0.05$)

Main effect of Detail-type ($p < 0.001$ with **Internals > Externals**)

No interaction of Task by Detail-type ($p > 0.05$)



Alternate Use Task (AUT) Scores for Old & New Ideas

Mean (Standard deviation)

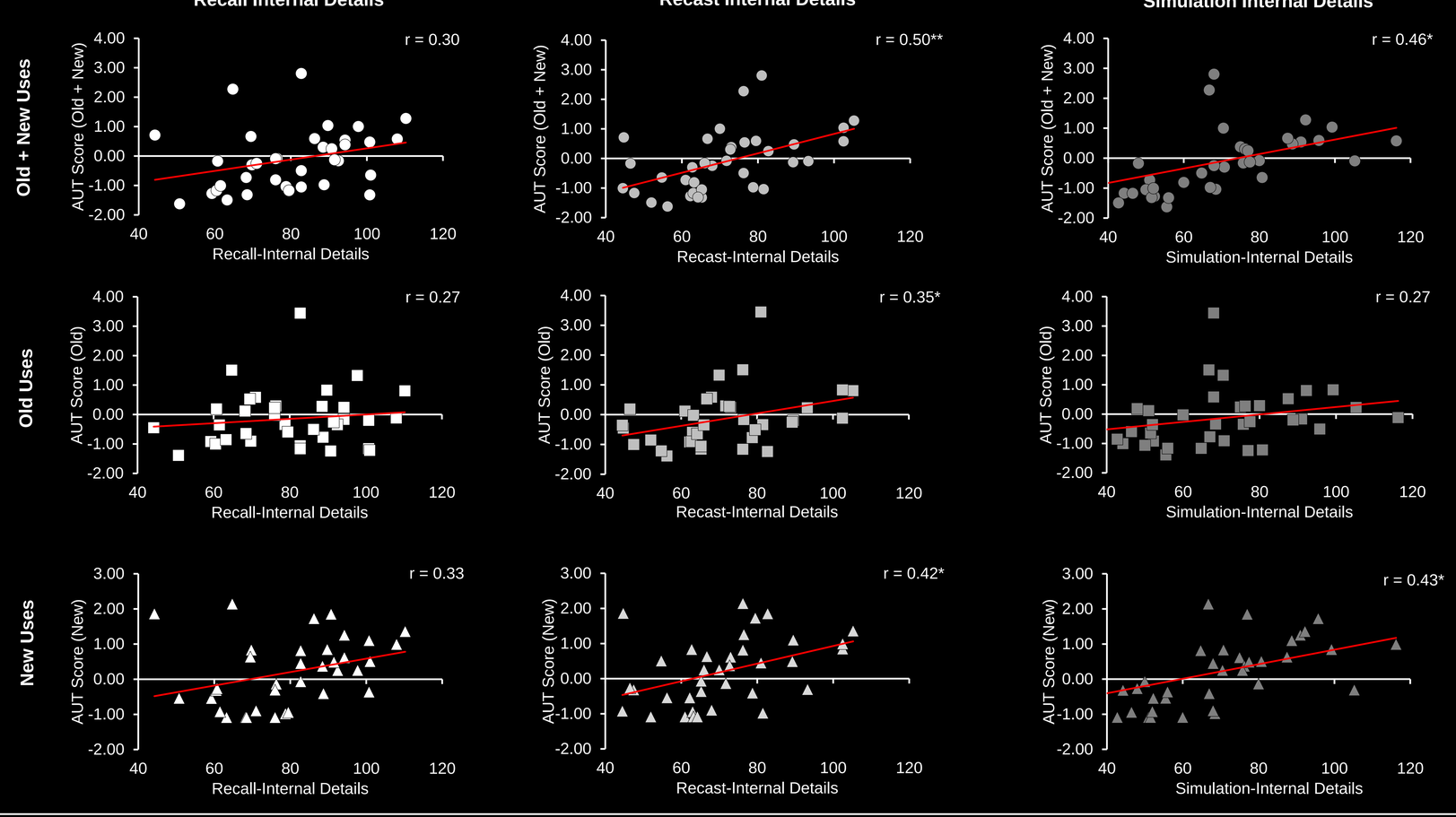
AUT Measure	Old + New	Old	New
Fluency	6.24 (1.77)	4.70 (1.46)	1.53 (1.14)
Flexibility	3.78 (0.92)	3.32 (0.83)	2.41 (1.52)
Originality	6.12 (3.12)	3.55 (2.00)	2.55 (2.06)
Appropriateness	6.23 (1.75)	4.69 (1.44)	1.53 (1.14)
Elaboration	5.16 (2.97)	3.63 (2.02)	1.52 (1.48)

Range of inter-correlations within a use type: r = 0.64 – 1.00, scores were mean-centered and collapsed into a mean divergent thinking score for correlation analyses

Mean AUT Score	Correlation with AI internal detail		
	Simulation	Recast	Recall
Z-scored AUT Score	*0.46***	*0.50***	*0.30*
Z-scored Old-AUT Score	*0.27*	*0.35**	*0.13*
Z-scored New-AUT Score	*0.43***	*0.42**	*0.33*

****p < 0.001, **p < 0.01, *p < 0.05*

Correlation Analyses: AI and Mean AUT Scores



Discussion

- The amount of internal/episodic details for both novel and recast future events was associated with divergent thinking (AUT scores), and this relationship was stronger with AUT scores for new creative ideas relative to old creative ideas
- There was no significant relationship between divergent thinking and the amount of episodic detail for recalled past events
- The current findings have implications for studies examining the neural correlates of episodic and divergent thinking because they illuminate the specific cognitive processes that overlap between different forms of episodic and divergent thinking (e.g., the attentional reorientation to a ‘novel’ state of mind)

References

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