



## First International Conference on the Science of Creative Thinking Bologna – Italy | Sept. 29 - Oct. 1

# The Measurement of Creativity

Consensual assessment technique,  
divergent thinking tasks, & questionnaires

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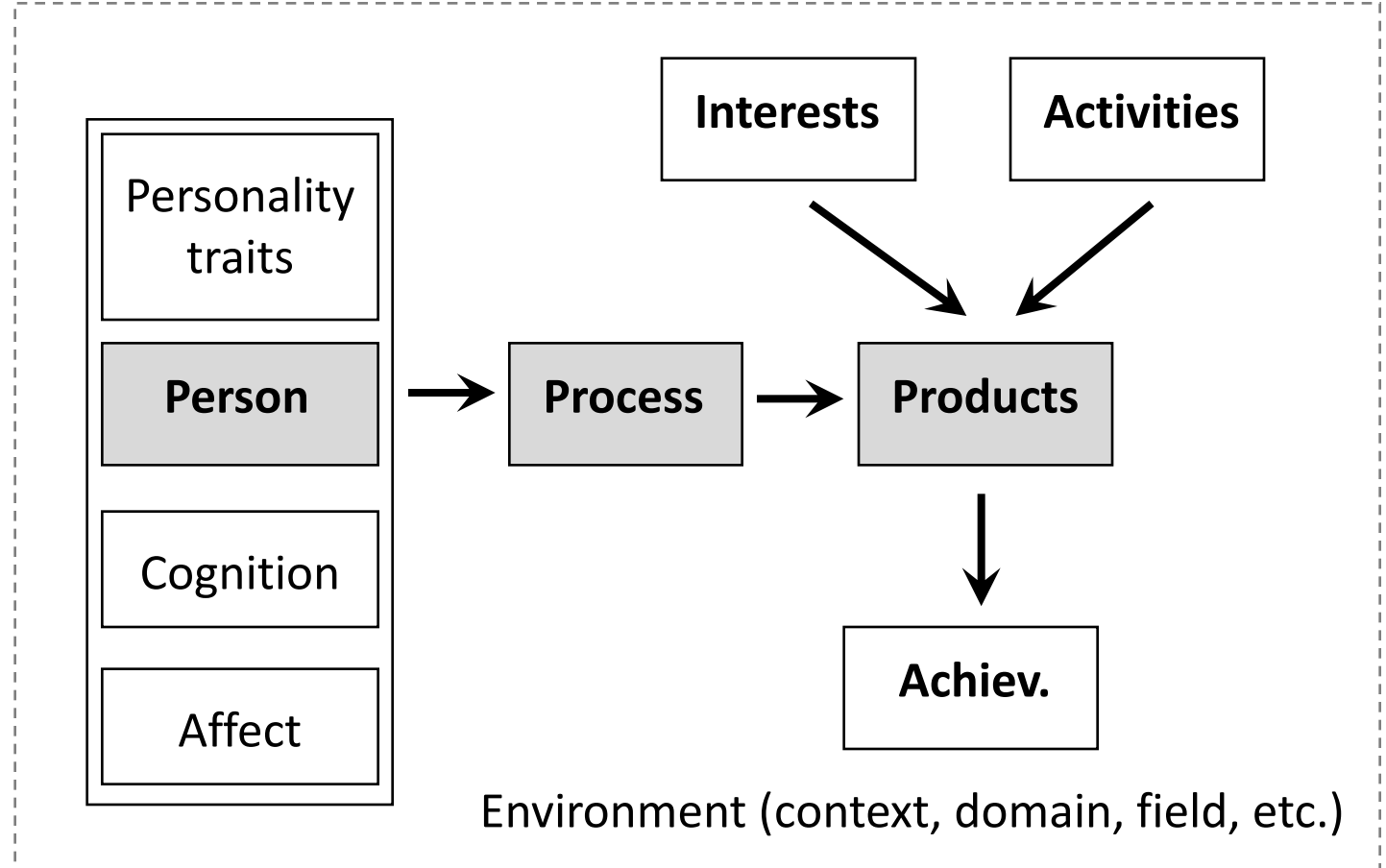


**PARIS  
DESCARTES**

- What is creativity?
- Levels and domains
- Measurement methods
  
- Objectives of this study
- Sample and variables
- About time costs
  
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- Summary, discussion
- Conclusion

# What is creativity?

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→ Importance of **novelty/originality** *and* **quality/relevance**

(e.g., Kaufman & Sternberg, 2010; Runco, 2004; Simonton, 2003)

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- Levels
  - Mini-c: micro discovery processes involved in learning
  - Small-c: everyday creativity (e.g., 'creative' hobbies)
  - Pro-C: 'professional' creativity (e.g., artists, scientists, engineers)
  - Big-C: eminent creativity (e.g., historic discovery)

→ All these levels are connected (≈continuum of creativity)
- Domains
  - Arts
    - Visual arts
    - Music
    - ...
  - Science
  - ...

→ Domains are also (partially) connected

(e.g., Kaufman & Baer, 2005 Kaufman & Beghetto, 2009; Root-Bernstein, Bernstein, & Garnier, 1995)

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There are *many* ways (direct and indirect) to assess creativity

- Person variables:
  - Personality traits
  - Cognitive abilities
  - Etc.
- Process variables:
  - The whole creative process
  - Some important cognitive abilities
- Product variables:
  - Divergent Thinking Tasks
  - Consensual Assessment Technique
- Other questionnaires:
  - Creative activities
  - Creative achievement

(e.g., Amabile, 1982; Gough, 1979; Guilford, 1950; McCrae, 1987; Silvia, Wigert, Reiter-Palmon, & Kaufman, 2012)

# Comparison of three classical methods

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	<b>Advantages</b>	<b>Drawbacks</b>
<b>Consensual Assessment Technique</b>	<b>Excellent quality</b> Measures actual creative performance	<b>High Cost</b> (long administration time; many experts needed)
<b>Divergent Thinking Tasks</b>	<b>Relatively low cost</b> (short administration time; scoring can be costly though)	<b>Not really creativity</b> More a cognitive ability (fluency) useful for creativity
<b>Activities and achievement Questionnaires</b>	<b>Low cost</b> (short administration time) <b>Bring additional info</b>	<b>Risk of validity issue</b> (e.g., over claiming) <b>Very indirect measure</b>

- No perfect method; all have strengths and weaknesses.
- Creativity has many faces. Various method should be used.
- A possible combination of those at reasonable cost?

# Objectives of the present study

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- Measurement of everyday creativity (small-c)
- In artistic domains (writing, visual, and others)
- Variables of interest
  - **Actual creative performance**
    - Based on classical divergent thinking tasks
    - Enhanced with Consensual assessment Technique
    - Time saving methods
  - **Self-reported questionnaires**
    - Interests
    - Activities
    - Achievement

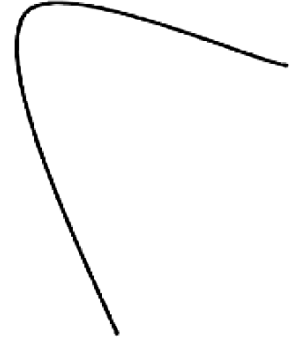
## Hypotheses:

- Tasks are moderately correlated ( $r$  about .30)
- Interests are strongly correlated ( $r > .50$ ), achievements are not
- Self-reported questionnaire positively predict tasks performance

# Sample and variables

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- n=150, 82% female, mean age  $\approx$  22 (SD=7.75)
- Three tasks
  - Boxes
    - Unlimited time
  - Short story
    - Explicit instruction about being creative
  - Drawing
- Ideas in these tasks are evaluated by 6 raters
  - 3 expert raters (creativity researchers)
  - 3 peers raters (research assistant, students)
  - Evaluations given on a 1-7 points scale, with specific instructions (e.g., novelty and quality)
  - Other scores: fluency and self-rating
- Questionnaires of interest, activities, and achievement in visual art, music, writing, drama, and other (n=161)



(Baer, Kaufman, & Gentile, 2004; Carson, Peterson, & Higgins, 2005; Kaufman, Baer, Cole, & Sexton, 2008; Kaufman, Lee, Baer, & Lee, 2007; Silvia et al., 2012; Verhaeghen, Joorman, & Khan, 2005)

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The cost of these tasks can be huge

- Participants take up to 20 minutes to complete one task  
 Hence **potentially one hour just to complete the creative tasks**
- Participants gave about 10 ideas in each tasks  
 Hence **potentially  $150 \times 10 \times 3 = 4'500$  ideas to rate**

Method to save time:

- Planned missing data design
  - Each participant complete only 2 tasks
  - Each rater rated only 2/3 of the participants
- Only top 2 ideas are rated

participant	task 1	task 2	task 3
1	NA		
2		NA	
3			NA
...	...	...	...
28	NA		
29		NA	
30			NA

→ Hence each rater has 'only'  **$100 \times 2 \times 2 = 400$  ideas to rate**

→ A consequence for statistical power: for correlations,  $n=50$

(Graham, Taylor, Olchowski, & Cumsille, 2006; Graham, 2009; Silvia et al., 2008; Silvia, Martin, & Nusbaum, 2009)

# Rating coverage

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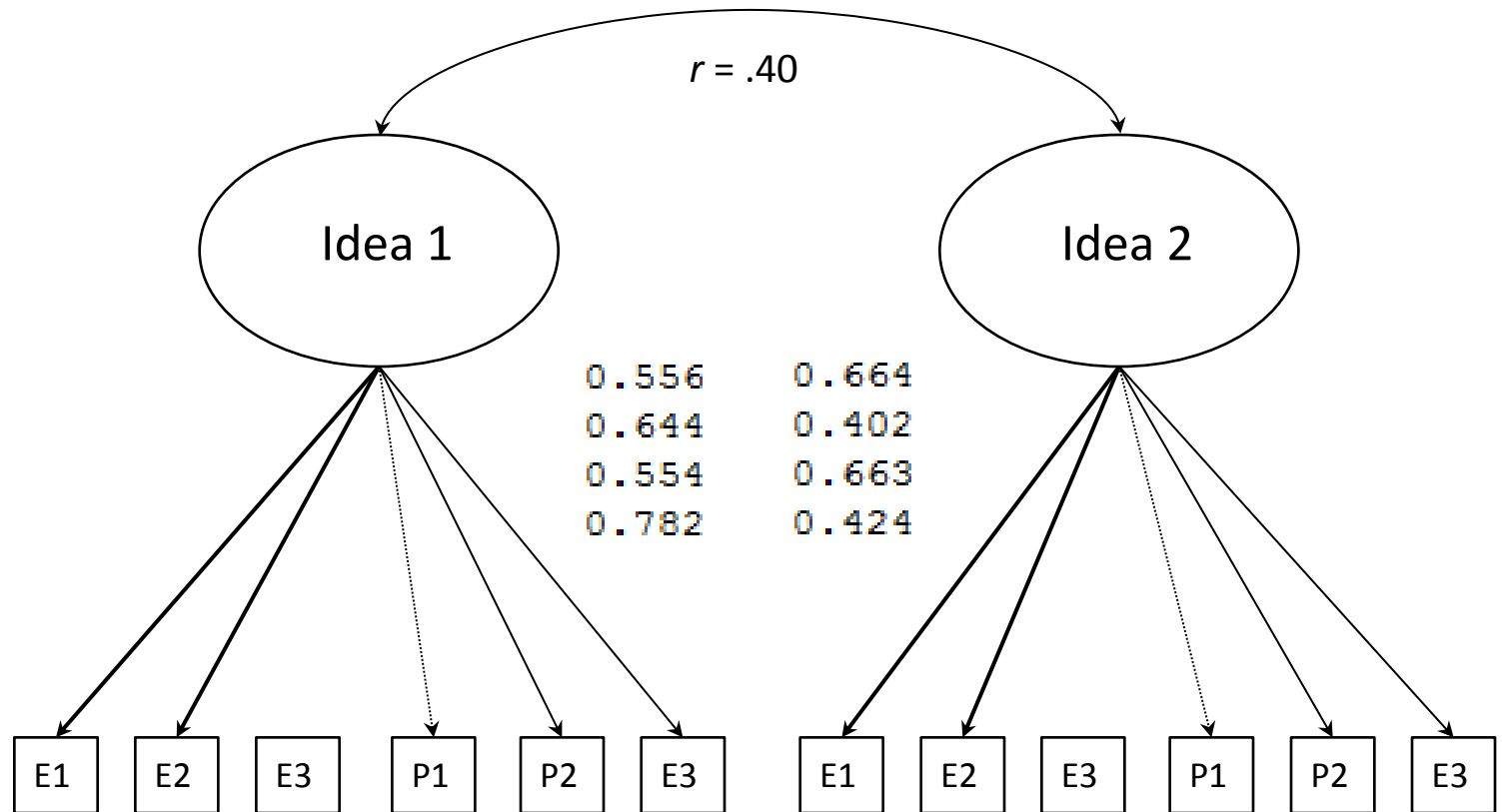
Boxes						Drawing						Story					
Experts			Peers			Experts			Peers			Experts			Peers		
E1	E2	E3	P1	P2	P3	E1	E2	E3	P1	P2	P3	E1	E2	E3	P1	P2	P3
		NA		NA	NA		NA			NA	NA	NA				NA	NA
		NA		NA	NA		NA			NA	NA	NA				NA	NA
		NA		NA			NA			NA		NA				NA	
		NA		NA			NA			NA		NA				NA	
		NA		NA			NA			NA		NA				NA	
		NA		NA			NA			NA		NA				NA	
		NA	NA				NA		NA			NA			NA		
		NA	NA				NA		NA			NA			NA		
		NA	NA		NA		NA		NA		NA	NA			NA		NA
		NA	NA		NA		NA		NA		NA	NA			NA		NA

Covariance coverage:

- Experts-Experts: 100%, 0%, 0%
- Peer-Peer: 33%, 66%, 66%
- Peer-Expert: 66%

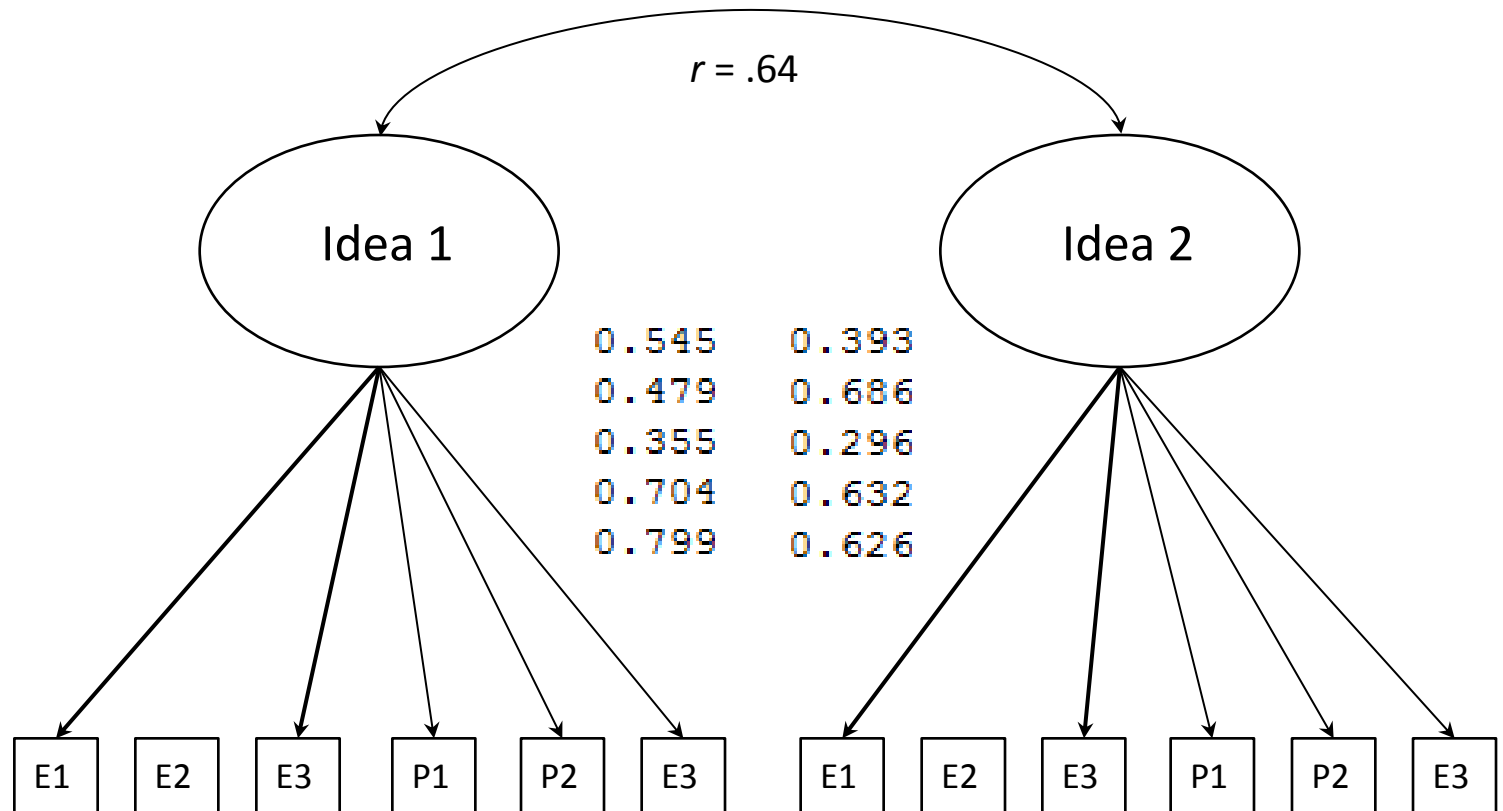
NB. Missing data are missing completely at random. This kind of data is easily handle by the FIML algorithm.

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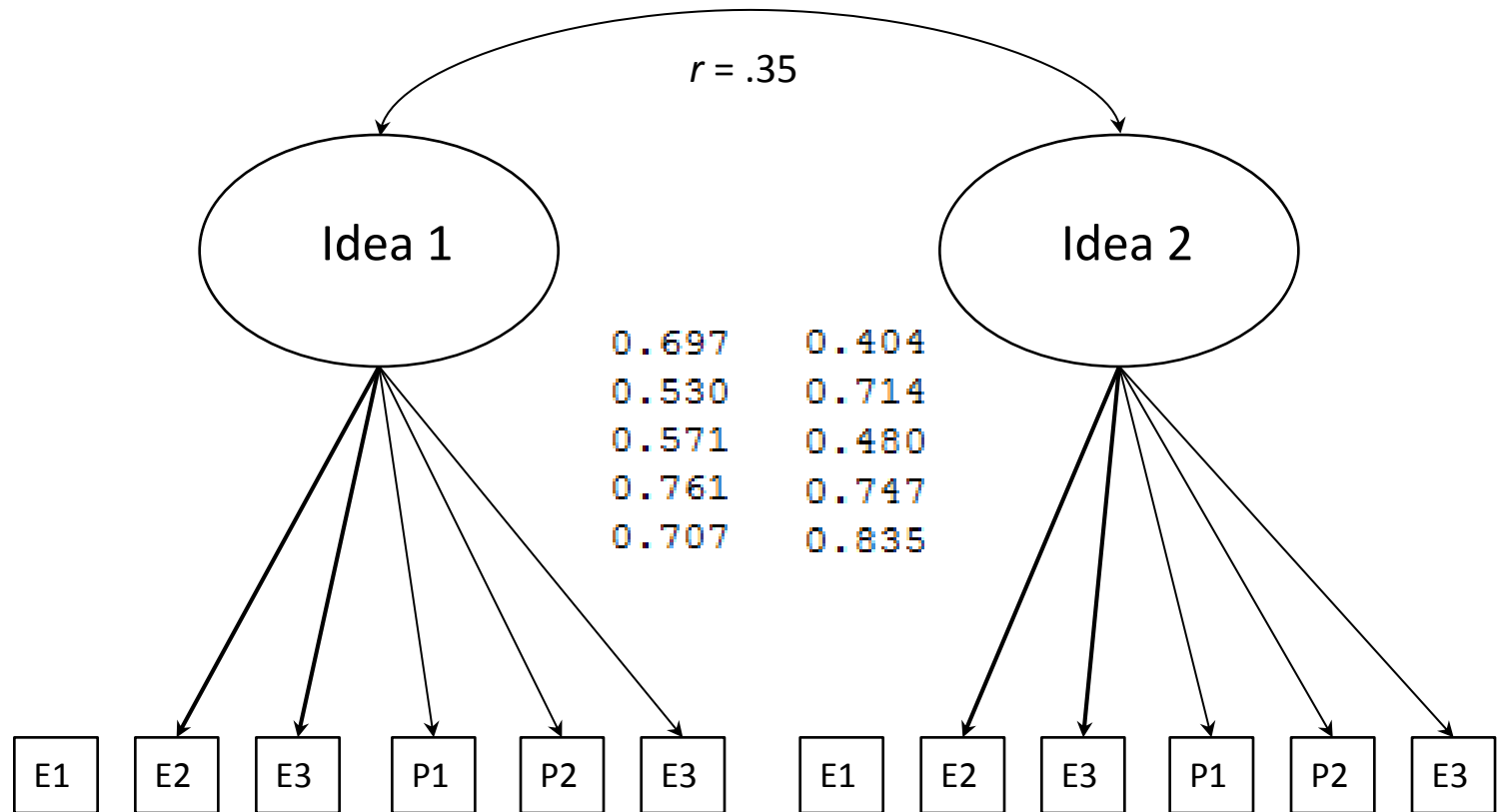
$\chi^2=43.1$ ;  $DF=19$ ;  $\chi^2/DF= 2.26$ ;  $RMSEA= 0.116$  (0.070; 0.162);  $SRMR=0.095$ .

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$\chi^2=27.6$ ;  $DF=34$ ;  $\chi^2/DF= 0.81$ ;  $RMSEA= 0 (0.000; 0.052)$ ;  $SRMR=0.080$ .

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$\chi^2=66.7$ ;  $DF=34$ ;  $\chi^2/DF= 1.96$ ;  $RMSEA= 0.098$  (0.063 0.133);  $SRMR=0.171$ .

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- Mean rating across the 2 ideas in each tasks

	BOXES	STORY
STORY	<b>0.49</b> N=47 p=.000	
DRAW	0.07 N=49 p=.624	-0.09 N=52 p=.523

# Questionnaires (creative interests)

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- Correlations between interests (yes/no question, n=161)

	WRITING	MUSIC	DRAMA	VISUAL
MUSIC	<b>0.25</b>			
DRAMA	<b>0.37</b>	<b>0.57</b>		
VISUAL	<b>0.55</b>	<b>0.43</b>	<b>0.51</b>	
OTHER	-0.04	0.06	0.11	0.26

- Correlations between intensity of interest

	WRITING	MUSIC	DRAMA	VISUAL
MUSIC	<b>0.28</b> N=75 p=.014			
DRAMA	<b>0.36</b> N=79 p=.001	<b>0.20</b> N=93 p=.050		
VISUAL	<b>0.39</b> N=89 p=.000	<b>0.42</b> N=97 p=.000	<b>0.39</b> N=100 p=.000	
OTHER	<b>0.33</b> N=45 p=.026	-0.05 N=54 p=.704	<b>0.34</b> N=56 p=.011	0.08 N=64 p=.543

(For activity and achievement, correlations are lower)

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- Correlations between tasks and interest (yes/no question)

	BOXES	STORY	DRAW
WRITING	0.14 N=94 p=.169	<b>0.26</b> N=96 p=.009	<b>0.21</b> N=98 p=.043
MUSIC	0.08 N=94 p=.461	0.15 N=96 p=.139	0.16 N=98 p=.106
DRAMA	0.05 N=94 p=.617	<b>0.25</b> N=96 p=.014	-0.06 N=98 p=.570
VISUAL	0.03 N=94 p=.761	<b>0.40</b> N=96 p=.000	<b>0.25</b> N=98 p=.011
TOTAL (including 'OTHER')	0.09 N=94 p=.367	<b>0.39</b> N=96 p=.000	0.16 N=98 p=.114

(Intensity of interest, activities, and achievement are virtually unrelated to the tasks. One exception for music and fluency)

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## Tasks

- The initial high cost of these tasks can be lowered
- It is possible to achieve acceptable reliability with a few raters
- For everyday creativity, novices are as reliable as experts
- Across domains, tasks are partially independent

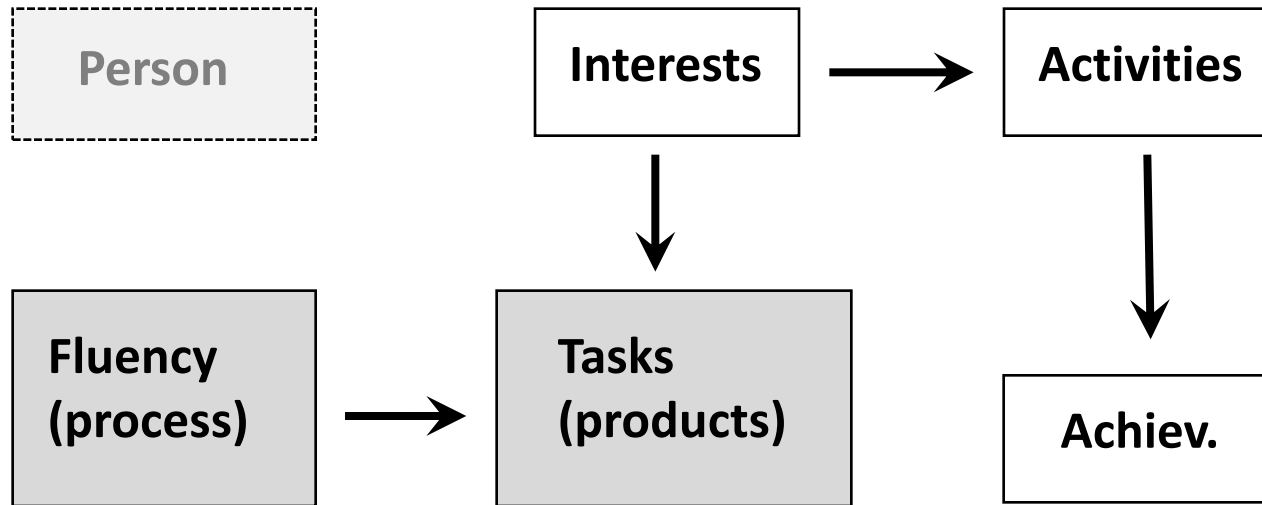
## Questionnaires

- Across domains, correlations between interests are moderate (between 0.20 and 0.50)
- Activities and achievements in different domains are only very slightly correlated (between 0.30 and 0)

## Tasks and questionnaire

- Creativity in tasks is only weakly correlated with self-reported interest in various domains (about 0.20)
- Creativity in tasks is unrelated to the *intensity* of interest, activity, and achievement

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- Creativity is a complex construct, yet measurable
- Most variables are positively correlated, but not very strongly
- Several assessment methods should be used
- This can be done at reasonable cost
- The method proposed here is a good compromise
- This could be extended (e.g., Big-C, scientific domain)



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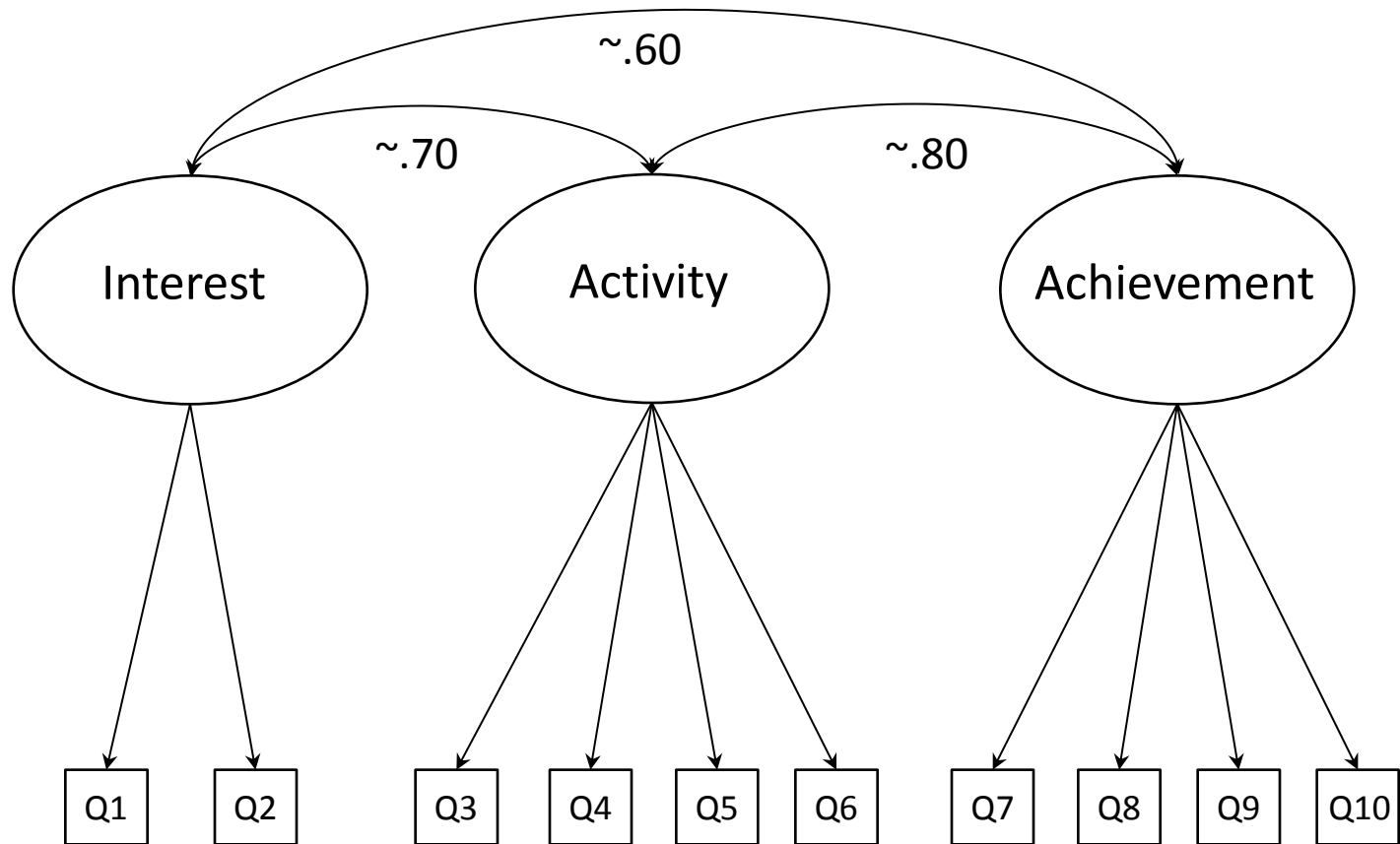
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# Interests, activities, and achievement



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- The same model in all four domains

# An extension to this study

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