What is Creative Potential?
From creative potential to genius
Torrance Study
(1950s-ongoing)
Torrance Test of Creativity

- **Instances**
  - Examples pertaining to a given category:
    - List round things

- **Alternate Uses**
  - Possible uses for a familiar object:
    - How many uses are there for a newspaper?

- **Consequences**
  - Outcomes of hypothetical situations
    - What would happen if people were able to understand the language of animals?
An Example...

What would happen if people could become invisible at will?
Some Original Responses

- Very shy people would have sex while being invisible.
- You could see only beautiful people on the beaches.
- Cops would wear infrared goggles.
- Paparazzi would be more effective.
- You could escape a bad date.
- It would be harder to play hide and seek.
Nonverbal Tests
(Wallach & Kogan, 1965)

Pattern meanings
Scoring the Tests

- Fluency - number of relevant responses
- Originality - infrequency of responses
- Flexibility - variety of categories of responses
- Elaboration - detail in the responses
Predictive Validity

(Torrance, 1988)

Table 2.3. Predictive validity of the Torrance Tests of Creative Thinking for males, females, and total sample for five criteria of creative achievement in 22-year follow-up

<table>
<thead>
<tr>
<th>Criteria of creative achievement</th>
<th>Males (N = 95)</th>
<th>Females (N = 116)</th>
<th>Total (N = 211)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of High School Creative Achievements</td>
<td>.33</td>
<td>.44</td>
<td>.38</td>
</tr>
<tr>
<td>Number of Post-High-School Creative Achievements</td>
<td>.58</td>
<td>.42</td>
<td>.46</td>
</tr>
<tr>
<td>Number of Creative Style-of-Living Achievements</td>
<td>.42</td>
<td>.48</td>
<td>.47</td>
</tr>
<tr>
<td>Quality of Highest Creative Achievements (ratings)</td>
<td>.59</td>
<td>.57</td>
<td>.58</td>
</tr>
<tr>
<td>Quality of Future Career Images</td>
<td>.62</td>
<td>.54</td>
<td>.57</td>
</tr>
</tbody>
</table>

Note: All coefficients of correlation are significant at the .001 level.
Culture Fairness

- Few differences between African Americans and European Americans and Native Americans
- Few differences between Hispanic Americans and European Americans on non-verbal assessments of creativity
- Few differences between Asian Americans and non-Asian Americans in measures of verbal, mathematical, and artistic creativity
“Beyonder” Characteristics

- Love of Work
- Persistence
- Purpose in Life
- Deep Thinking
- Tolerance of Mistakes
- Open to change
- Risk taking
- Feeling comfortable as a minority of one
“Life’s most energizing and exciting moments occur in those split seconds when our struggling and searching are suddenly transformed into the dazzling aura of the profoundly new, an image of the future... One of the most powerful wellsprings of creative energy, outstanding accomplishment, and self-fulfillment seems to be falling in love with something—your dream, your image of the future.”

– E. Paul Torrance
E. PAUL TORRANCE’S MANIFESTO for CHILDREN

Don’t be afraid to fall in love with something and pursue it with intensity.

Know, understand, take pride in, practice, develop, exploit and enjoy your greatest strengths.

Learn to free yourself from the expectations of others and walk away from the games they impose on you.

Free yourself to play your own game.

Find a teacher or mentor who will help you.

Learn the skills of interdependence.

Don’t waste your time trying to be well rounded.

Do what you love and can do well.

The Creative Personality
Openness to Experience
Openness to Experience

- Is curious about many different things.
- Is inventive, finds clever way to do things.
- Believe in the importance of art.
- Likes philosophical discussions.
- Love to reflect on things.
- Often get lost in thought.
- Often daydream.
- Like poetry.
- Get deeply immersed in music.
- Need a creative outlet.
Creative Achievement Questionnaire
(CAQ; Carson, Peterson, & Higgins, 2005)
Visual Arts, Music, Dance, Architecture, Creative Writing, Humor,
Inventions, Scientific Discovery, Theatre/Film, Culinary Arts

Visual Arts (painting, drawing, sculpture, photography)
__ 0. I have no training or recognized talent in this area.
__ 1. I have taken lessons in this area.
__ 2. People have commented on my talent in this area.
__ 3. I have won a prize or prizes at a juried art show.
__ 4. I have had a showing of my work in a gallery.
__ 5. I have sold a piece of my work.
__ 6. My work has been critiqued in local publications.
__ 7. My work has been critiqued in national publications.
<table>
<thead>
<tr>
<th>Trait</th>
<th>Creative Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>IQ</td>
<td>.11</td>
</tr>
<tr>
<td>Divergent Thinking</td>
<td>.19</td>
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<tr>
<td>Openness to Experience</td>
<td>.36</td>
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<tr>
<td>Neuroticism</td>
<td>.00</td>
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<tr>
<td>Agreeableness</td>
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<td>Conscientiousness</td>
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<tr>
<td>Extraversion</td>
<td>.17</td>
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</tbody>
</table>

Grit
Passion and Perseverance for Long-Term Goals
The Grit Scale
(Duckworth et al., 2007)

O **Consistency of Interests**
  O “New ideas and projects sometimes distract me from previous ones.”
  O “My interests change from year to year.”
  O “I often set a goal but later choose to pursue a different one.”
  O I become interested in new pursuits every few months.

O **Perseverance**
  O I have achieved a goal that took years of work.
  O “I have overcome setbacks to conquer an important challenge.”
  O “Setback don’t discourage me.”
  O “I am a hard worker.”
Grohman et al., submitted (325 college students)

<table>
<thead>
<tr>
<th></th>
<th>Openness to Experience</th>
<th>Grit Scale</th>
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<tbody>
<tr>
<td>Everyday Creativity</td>
<td>.35</td>
<td>.09</td>
</tr>
</tbody>
</table>
Epistemic Curiosity

- The motive to seek, obtain and make use of new knowledge.
Epistemic Curiosity

- Correlated with:
  - Self-directed learning goals
  - Self-regulation
  - Academic achievement
Epistemic Curiosity

- Two types:
  - A desire for new information anticipated to increase pleasurable feelings (*interest type*)
  - A motive to reduce the unpleasant experiences of feeling deprived (*deprived type*)
Curiosity- Interest

- “I enjoy exploring new ideas.”
- “I enjoy learning about subjects that are unfamiliar to me.”
- “I find it fascinating to learn new information.”
- “When I learn something new, I would like to find out more about it.”
- “I enjoy discussing abstract concepts.”
Curiosity- Deprivation

- “Difficult conceptual problems can keep me awake all night thinking about solutions.”
- “I can spend hours on a single problem because I just can’t rest without knowing the answer.”
- “I feel frustrated if I can’t figure out the solution to a problem, so I work even harder to solve it.”
- “I brood for a long time in an attempt to solve some fundamental problem.”
- “I work like a fiend at problems that I feel must be solved.”
Kaufman, Litman, Duckworth, et al. (in prep)

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<tr>
<td>IQ</td>
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<tr>
<td>Curiosity- Interest</td>
<td>+</td>
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<tr>
<td>Curiosity- Deprivation</td>
<td>ns</td>
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<tr>
<td>Grit- Consistency of Interests</td>
<td>-</td>
</tr>
<tr>
<td>Grit- Perseverance</td>
<td>+</td>
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</tbody>
</table>
“The Gritty Imagination”
IPAR Study

- Institute for Personality Assessment and Research (IPAR) 1950-1970

- Target groups selected and intensively studied (three day live-in assessments)

- Studies of graduate students, architects, mathematicians, writers, businessmen

- What are these successful people like?
Some Interesting Findings

- High independence of judgment
  - Less likely to conform in Asch’s experimental procedure

- Creative people are more ‘sane’ and more ‘insane’ than the general population
  - Have high scores on MMPI clinical scales, but also on ego-strength
“Thus the creative genius may be at once naive and knowledgeable, being at home equally to primitive symbolism and to rigorous logic. He is both more primitive and more cultured, more destructive and more constructive, occasionally crazier and yet adamantly saner, than the average person.”

- Frank X. Barron
Messy Minds
“What dictates their behavior is not a rigid inner structure, but the demands of the interaction between them and the domain in which they are working.” – Mihaly Csikszentmihalyi
Creative People Are...

- Mindful Daydreamers
- Imaginatively Gritty
- Passionately Introverted
- Openly Sensitive
- Playfully Serious
- Logically Intuitive
- Vulnerably Resilient
- Rebellious Experts
THE NEUROSCIENCE OF CREATIVITY
The Networks of Imagination
“Imagination Network”

1. VENTROMEDIAL PREFRONTAL CORTEX
2. DORSOMEDIAL PREFRONTAL CORTEX
3. ANTERIOR MIDDLEcingULATE CORTEX
4. PRECUNUS
5. POSTERIOR CINGULATE CORTEX
6. INFERIOR PARietAL LOBULe
7. HIPPOCAMPUS

Imagination Network is associated with...

- Mind wandering
- Daydreaming
- Imagining and planning the future
- Self-awareness
- Reflective compassion
- Reasoning about moral dilemmas
- Reading fiction
Imagination Network is associated with...

- Retrieval of deeply personal memories
- Evaluation of social and emotional implications of another person’s situation
- Monitoring one’s emotional state
- Reflective consideration of meaning of experiences
- Mentally simulating the perspective of another person
Executive Control Network
(Working Memory, Inhibition, Flexibility)

FRONTOPOLAR CORTEX (BA 10)
VENTROLATERAL PREFRONTAL CORTEX (BA 45, 47)
DORSOLATERAL PREFRONTAL CORTEX (BA 46, 47)
SUPERIOR PARietAL CORTEX (BA 7)
INFERIOR PARietAL CORTEX (BA 40, 39)
PREMOTOR CORTEX (BA 6)
DORSAL ANTERIOR CINGULATE (BA 32)


Illustrator: George Doutsiopoulos
Salience Network
(dorsal anterior cingulate cortices [dACC] and anterior insula [AI])
Default and Executive Network Coupling Supports Creative Idea Production

Roger E. Beaty¹, Mathias Benedek², Scott Barry Kaufman³ & Paul J. Silvia⁴

The role of attention in creative cognition remains controversial. Neuroimaging studies have reported activation of brain regions linked to both cognitive control and spontaneous imaginative processes, raising questions about how these regions interact to support creative thought. Using functional magnetic resonance imaging (fMRI), we explored this question by examining dynamic interactions between brain regions during a divergent thinking task. Multivariate pattern analysis revealed a distributed network associated with divergent thinking, including several core hubs of the default (posterior cingulate) and executive (dorsolateral prefrontal cortex) networks. The resting-state network affiliation of these regions was confirmed using data from an independent sample of participants. Graph theory analysis assessed global efficiency of the divergent thinking network, and network efficiency was found to increase as a function of individual differences in divergent thinking ability. Moreover, temporal connectivity analysis revealed increased coupling between default and salience network regions (bilateral insula) at the beginning of the task, followed by increased coupling between default and executive network regions at later stages. Such dynamic coupling suggests that divergent thinking involves cooperation between brain networks linked to cognitive control and spontaneous thought, which may reflect focused internal attention and the top-down control of spontaneous cognition during creative idea production.
Default and Executive Coupling Supports Creative Idea Production

Beaty, Benedek, Kaufman, & Silvia, Nature Scientific Reports

Figure 1: Multivariate pattern analysis for the whole-brain task contrast (alternate uses > object characteristics).
Figure 9: Graph theory analysis of the functional network associated with divergent thinking.

(A) Nodes (ROIs from the whole-brain analysis) and edges (paths between the nodes) that were used to define the divergent thinking network. (B) Scatter plot depicting the correlation between composite creativity scores (i.e., average divergent thinking creativity ratings) and global efficiency of the divergent thinking network.
The Imagination Institute is dedicated to making progress on the measurement, growth, and improvement of imagination across all sectors of society.

http://imagination-institute.org
TEAM
OFF THE BEAT
GONE ROGUE

Harrison Auditorium
April 24 & 25 7pm
$10 on Locust and at the door
Venue: Jordan Feingold
# Grants Competition

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<tr>
<th>Princeton University</th>
<th>University of Alabama</th>
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<td><strong>Identifying the Role of Simulation in Imagination Expertise</strong></td>
<td><strong>Fantasy Orientation: Measuring Individual Differences, Improving Imaginative Play, &amp; Assessing Mechanisms of Cognitive Development</strong></td>
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<td><strong>The Benefits of Daydreaming for Creativity &amp; Creative Writing</strong></td>
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<td><strong>Measuring &amp; Improving Adolescents' Social-Emotional Imagination to Foster Flourishing: A Mixed-Method Neuroimaging &amp; Psychosocial Longitudinal Study with School-Based Interventions</strong></td>
<td><strong>NEURO</strong></td>
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<td>Northwestern University</td>
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<td><strong>The Four Factor Imagination Theory (4FIT): Strategy, Methodology, &amp; Anticipated Results</strong></td>
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<td><strong>The School Imagination, Creativity, &amp; Innovation (ICI) Index &amp; Portfolio</strong></td>
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<tr>
<td><strong>EDUCATION</strong></td>
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</table>
Grants Competition

University of North Carolina, Chapel Hill

Creativity & the Quantification of Free Thought
LANGUAGE

Goldsmith's University of London, UK

Introducing imQ: Assessing & Improving Imagination
PERSONALITY

Thomas Jefferson University & Hospital

The Neurological Correlates of Creativity in Geniuses
NEURO

University of Pennsylvania

Transcranial Direct Current Stimulation to Enhance Creative Uses for Objects
NEURO

University of North Carolina, Greensboro

Measuring Imagination with Functional Network Connectivity
NEURO

Brooklyn College

Assessing & Fostering Visual Imagination through Drawing
DEVELOPMENT
Grants Competition

Wesleyan University

Structural & Functional Biomarkers of Aesthetic Creativity & Imagination

NEURO

Pace University & Yale University; University Paris Descartes

Measurement & Development of Narrative Imagination (NI)

LANGUAGE

College of William & Mary

A Motivational Approach to the Enhancement of Imagination & Human Flourishing

EDUCATION

Yale University

Self-Regulation in Creativity: The Difference Between Having an idea & Doing Something With It

PERSONALITY
Outreach
http://thefutureproject.org
WE IMAGINE A WORLD WHERE ANY STUDENT ANYWHERE CAN PUT A DREAM INTO ACTION.
Dream Directors
Thank you!