

Innovation & Creativity:
Climate is important...
but don't forget selection

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Overview:

Characteristics that Predict Creativity

- **Individual characteristics**
 - Cognitive ability
 - Personality characteristics
- **Team-level characteristics**
 - Composition
 - Conflict
 - Participation
- **Leader characteristics**

Cognitive Ability

Relationship to Creativity

- $r_{\text{obs}} = .26; \rho = .35$

meta-analysis; $k = 8; N = 1,272$ (Harrison et al., 2006)

- $r_{\text{obs}} = .25; \rho = .36$

meta-analysis; graduate students; Miller Analogies Test;
 $k = 6; N = 1,104$ (Kuncel et al., 2004)

Cognitive Ability

Relationship to Creativity

- **Threshold hypothesis:**

Intelligence relates positively to creativity, but only up to a certain ability level, above which the relationship is negligible. (Guilford, 1967)

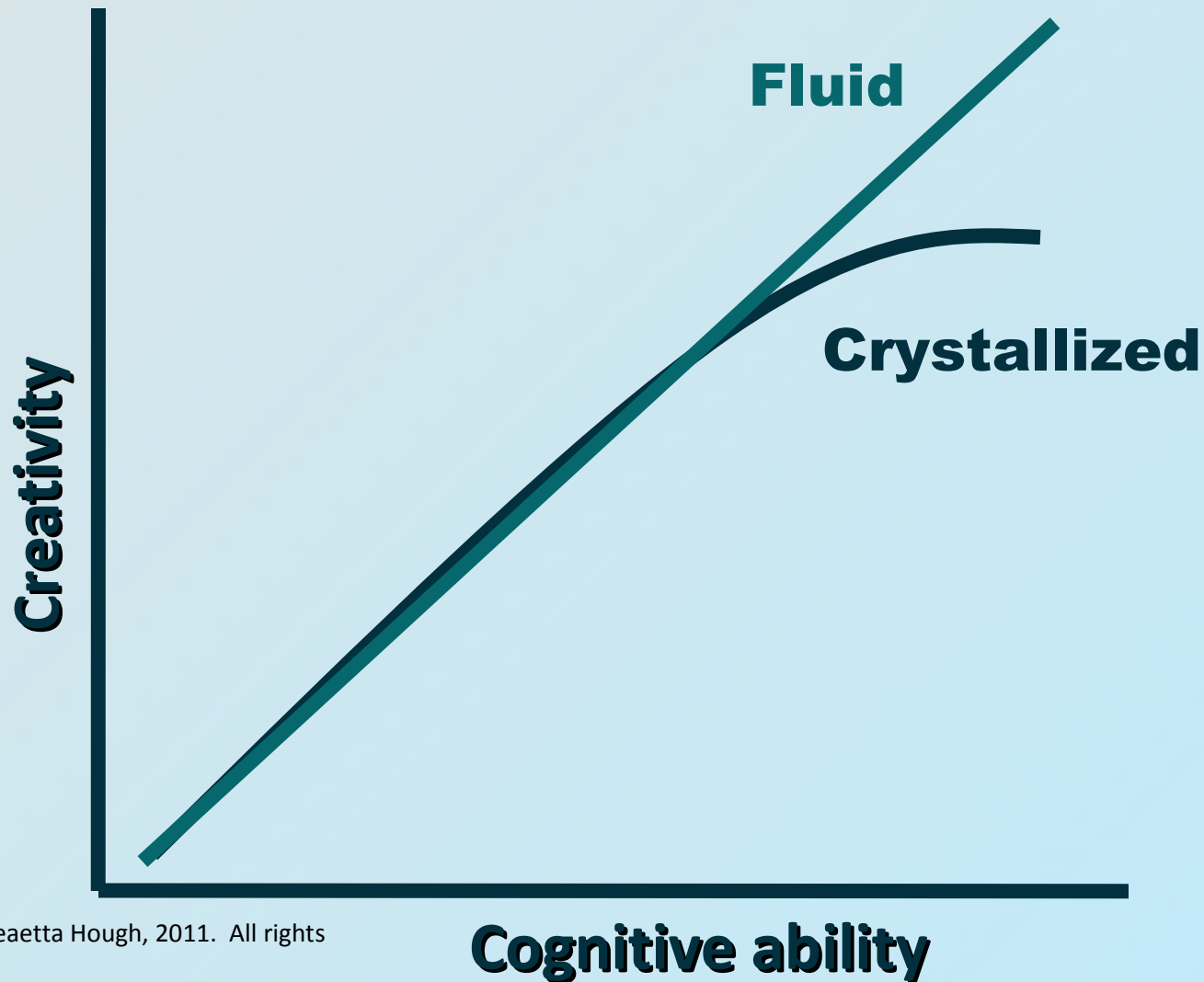
- Threshold: IQ of ~120.
- Common problem: severe range restriction in high ability groups

Threshold Hypothesis: *Fluid vs. Crystallized Abilities*

- **Threshold hypothesis supported for crystallized ability...**
 - *r is strong and positive in the normal IQ range, but weak for high-ability people.*
- **but not for fluid intelligence.**
 - *For fluid intelligence r is strong and positive for high-ability people.*

Sligh (2003) & Sligh et al. (2005)

Threshold Hypothesis: Slight Results



Divergent Thinking

Relationship to Creativity

Divergent Thinking: (Guilford construct, 1950)

- *Ability to generate multiple potential solutions to a problem*
- *Measure of idea production*

Taylor (1963) study of research scientists:

- **$r = .62$ early stages of career**
- **$r = .41$ middle stages of career**
- **$r = .17$ later stages of career**

Cognitive Ability: Recommendations

- Given domain-specific knowledge...
 - **use fluid ability tests**, e.g.,
 - figural or symbolic reasoning measures
 - **rather than crystallized ability tests** e.g.,
 - reading or math measures
 - **include a test of divergent thinking**

Personality: *Emotional Stability*

Relationship to Creativity

Within organizational settings:

- $r_{\text{obs}} = -.05$

meta-analysis; $k = 8$; $N = 442$ (Hough, 1992)

- $r_{\text{obs}} = -.01$; $\rho = -.02$

meta-analysis; $k = 7$; $N = 1,780$ (Harrison et al., 2006)

- $r_{\text{obs}} = .02$

meta-analysis; creative scientists; $k = 66$ (Feist, 1998)

Within the arts (artists, writers, directors, composers):

- $r_{\text{obs}} = -.07$

meta-analysis; artists vs. non-artists; $k = 128$; (Feist, 1998)

- **Eysenck qualitative review (1995)**

Protective Factors for Psychopathology

- **Ego-Resiliency** (J. H. Block & Block, 1980; Klohnen, 1996)
 - Adaptive flexibility in times of stress
 - Responding to dynamic situational demands
 - Constructively dealing with change
- **Ego Strength** (MacKinnon, 1962; architects) (Barron, 1953); (Gough, 1992)
- **Hardiness** (Maddi et al., 2006)

Creativity: Reactions to Observed Anger

Individuals:

- **Solve more analytic problems** (Miron-Spektor et al., 2011) **but,**
- **But fewer creative problems** (Miron-Spektor et al., 2011)

Hypothesis:

- **Emotional Stability moderates the relationship between observed anger and creativity**
 - **Observed anger and hostility in the environment affects hardy, resilient people less; their creativity is affected less**

Personality: *Extraversion*

Relationship to Creativity

- $r_{\text{obs}} = .04$; $\rho = .04$; meta-analysis; $k = 7$;
 $N = 1,780$ (Harrison et al., 2006)

Possible Moderator Variable – Type of Work:

- $r_{\text{obs}} = .08$; meta-analysis; artists vs. non-artists;
 $k = 148$ (Feist, 1998)
- $r_{\text{obs}} = .14$; meta-analysis; creative scientists;
 $k = 135$ (Feist, 1998)

Extraversion Facets: **Relationship to Creativity**

<u>Type of Work</u>	<u>Dominance</u>	<u>Sociability</u>
Across Jobs (meta-analysis; Hough, 1992)	.21 K=11, N=550	Mean r_{obs}
Across Jobs (Weiss, 1981)		Neg. N=225
Scientists (meta-analysis, Feist, 1998)	.19 K=42	.07 K=23
Artists vs. non-artists (meta-analysis; Feist, 1998)	.08	.01

Personality: *Conscientiousness*

Relationship to Creativity

- $\rho = .01$
meta-analysis; $k = 8$; $N = 1,653$ (Harrison et al., 2006)
- $\rho = .01$
meta-analysis; $k = 3$ (Eder & Sawyer, 2007)

Moderator Variable – Type of Work

- $r_{\text{obs}} = -.29$
meta-analysis; **artists** vs. non-artists; $k = 152$ (Feist, 1998)
- $r_{\text{obs}} = .07$
meta-analysis; creative scientists; $k = 135$ (Feist, 1998)

Conscientiousness Facets: Relationship to Creativity

Facet	Relationship to Creativity	Exemplary Studies
Dependability	<i>Negative</i>	Welsh (1975); Hough (1992)
Cautiousness (vs. Risk Taking)	<i>Negative</i>	Welsh (1975); King (1990)
Achievement (including Motivation)	<i>Positive</i>	Amabile et al. (1994); Feist (1998); Hough (1992); Harrison et al. (2006); Eder & Sawyer (2007)

Personality: *Openness to Experience*

Relationship to Creativity

- $r_{\text{obs}} = .24$; $\rho = .31$
meta-analysis; $k = 7$; $N = 1,304$ (Harrison et al., 2006)
- $\rho = .17$
meta-analysis; $k = 7$; (Eder & Sawyer, 2007)
- $r_{\text{obs}} = .21$ (artists vs. non-artists)
meta-analysis; $k = 93$ (Feist, 1998)
- $r_{\text{obs}} = .18$ (creative scientists)
meta-analysis; $k = 52$ (Feist, 1998)

Personality: *Agreeableness*

Relationship to Creativity

- $r_{\text{obs}} = .02$; $\rho = .03$
meta-analysis; $k = 6$; $N = 1,155$ (Harrison et al., 2006)
- $r_{\text{obs}} = -.10$
meta-analysis; **artists** vs. non-artists; $k = 63$ (Feist, 1998)
- $r_{\text{obs}} = -.03$
meta-analysis; **creative scientists**; $k = 64$ (Feist, 1998)

Personality: Special Purpose Scales

Creative Personality

- self-confident
- nonconventional
- individualistic
- resourceful
- Preference for unpredicted and improbable
- egotistical
- cautious (-)
- persistent
- wide interests

- $r_{\text{obs}} = .26; \rho = .37$

$N = 1,086; k = 15$ (Hough & Dilchert, 2007)

- **Heritability estimate .54**

(Waller et al., 1993)

Recommended Test Battery: Validity for Innovative Contributions

<u>Predictor</u>	R_{obs}	ρ
Fluid intelligence	.30	.33
Divergent thinking	.40	.40
Achievement (motivation)	.20	.22
Dominance	.19	.21
Creative Personality scales	.26	.37
Overall validity (Hough & Dilchert, 2007)	.53	.58
Risk taking	?	?
Hardiness, resiliency	?	?
Energy	?	?

Innovation:

Individual Variables & Team Composition

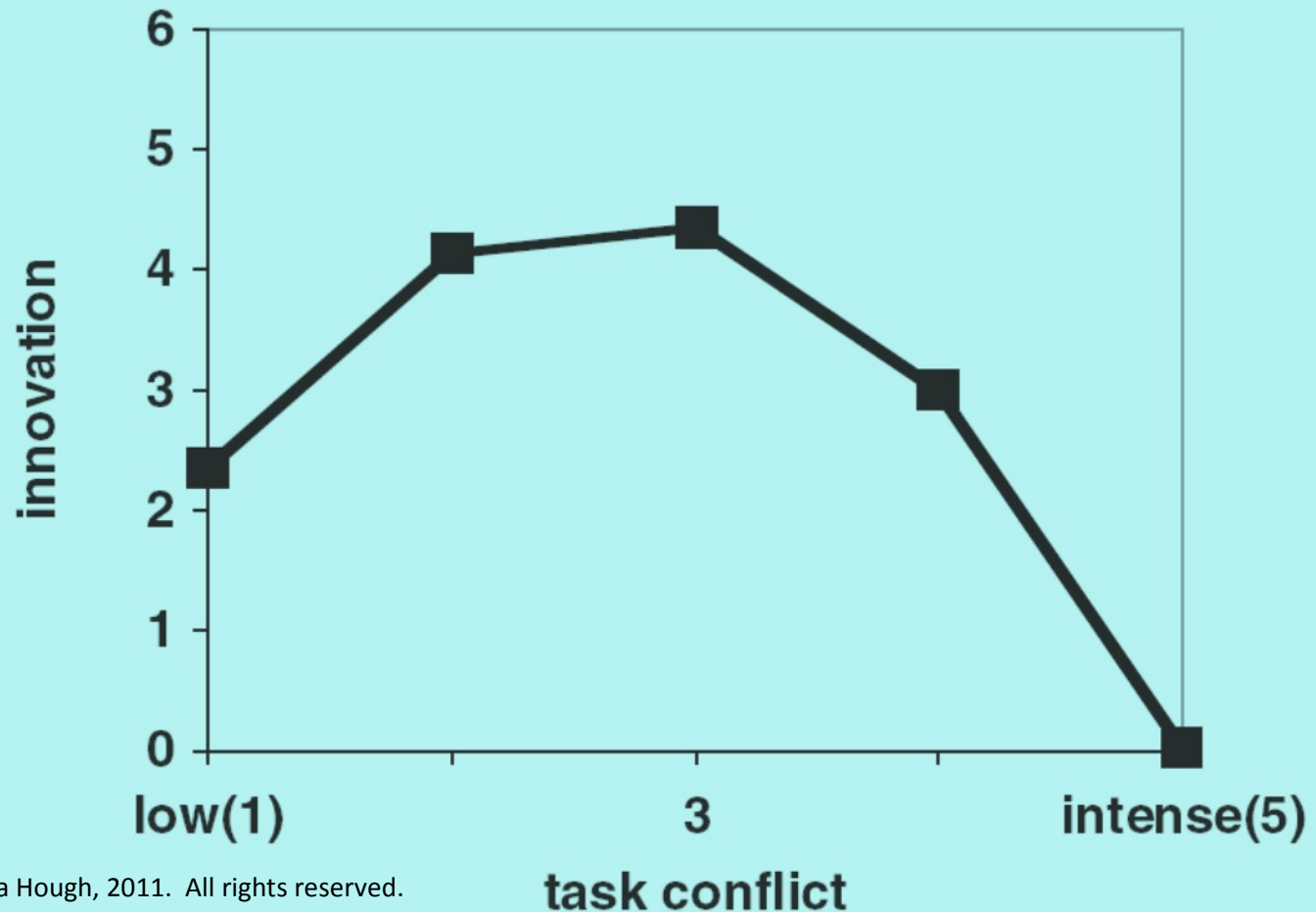
- **Quality** of team innovation
 - More creative team members, higher quality of team innovations
(West & Anderson, 1996) ($N = 27$ teams)
- **Overall project creativity**
 - More creative team members, more innovative outcomes
(Pirola-Merlo & Mann, 2004) ($N = 54$ R&D teams)

Staffing Teams for Innovation

- High levels of individual creativity
- High proportion of creative individuals
- Emotionally hardy, resilient individuals
- Some team members that
 - are dependable
 - like to get along with others

Innovation & Social Processes: Task Conflict

- Moderate degree of task conflict is conducive to team innovation (De Dreu, 2006)
- But only during early phases (Farh et al., 2010)

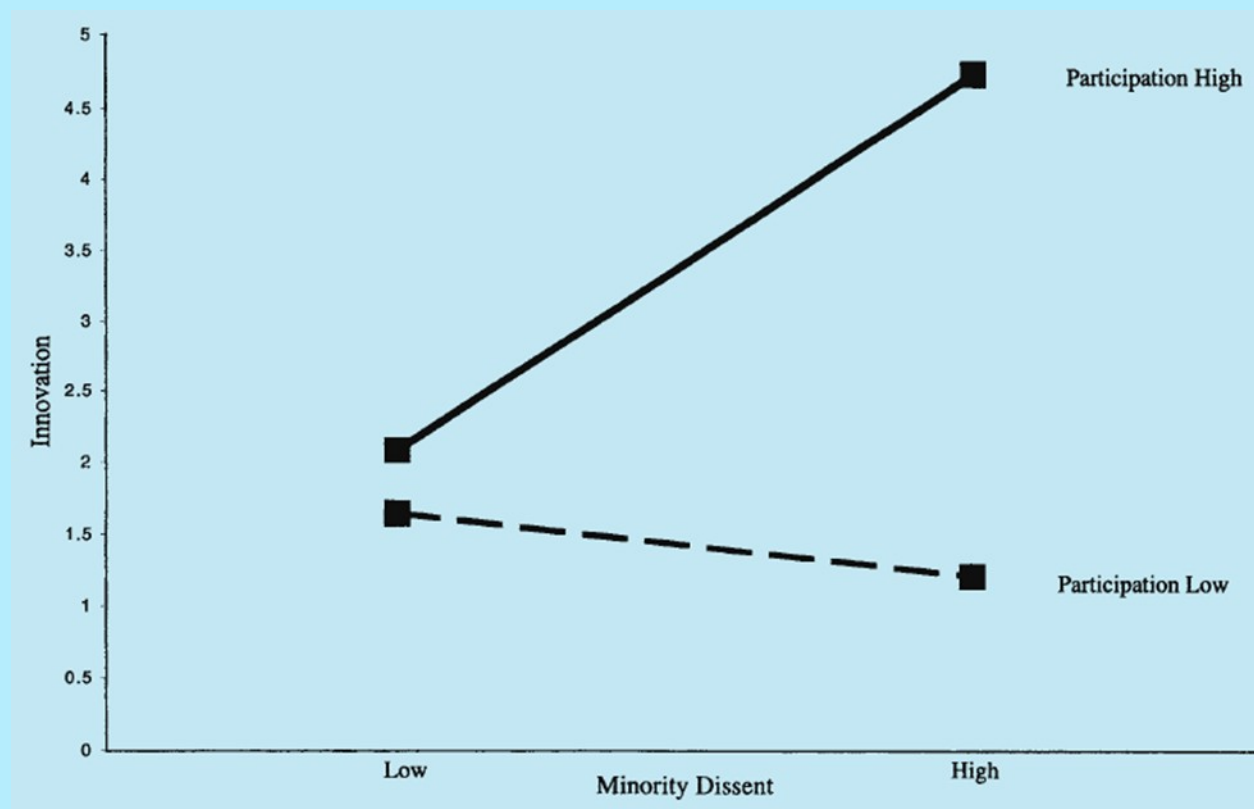


Innovation & Social Processes: **Participation**

- **Quantity** of innovations affected by social processes
 - **more participation**, more innovations
(West & Anderson, 1996) ($N = 27$ teams)
 - relationship is probably **curvilinear**

Innovation: Conflict & Participation

Team conflict is conducive of innovation, but only if minority group members have an opportunity to participate in decision making (De Dreu & West, 2001)



Innovation: Stress

Effect depends on amount and type of stress and the individual (Byron et al., 2010)

- Moderate degree of evaluative threat is conducive to innovation
- Lack of control is negatively related to innovation
- Trait anxiety moderates relationship

Team-level Variables – Composition & Structure:

Relationship to Creativity

(Hulsheger et al., 2009 meta-analysis)

<u>Composition</u>	ρ	k	N
Job-relevant diversity	.16*	10	4,371
Background diversity	-.13*	7	3,484
Team longevity	.13*	7	3,480
Team size	.24*	22	1,276
<u>Structure</u>			
Task interdependence	.04	4	977
Goal interdependence	.28*	5	1,174

Team-level Variables – Process & Climate:

Relationship to Creativity

(Hülsheger et al., 2009; meta-analysis)

<u>Process & Climate Variable</u>	ρ	k	N
Participative safety	.10*	22	15,601
Cohesion	.19*	8	2,785
Internal communications	.26*	9	2,848
External communications	.36*	5	1,256
Vision	.39*	10	2,292
Climate of excellence	.44*	13	3,490
Support for innovation	.48*	20	11,147

Leadership & Individual Creativity

<u>Meta-analysis</u>	Validity	
	<u>Transformational Leadership</u>	<u>Leader Member Exchange (LMX)</u>
Harrison et al. (2006)	.07¹ <i>k</i> = 4; <i>N</i> = 1,096	.22¹ <i>k</i> = 84; <i>N</i> = 1,814
Eder & Sawyer (2007)	.21² <i>k</i> = 6; <i>N</i> = ?	.23² <i>k</i> = 12; <i>N</i> = ?

¹ Corrected for restriction in range and criterion unreliability.

² Corrected for unreliability in predictor.

Leadership & Innovation

<i>Team Performance</i>	r_{obs} <i>Transformational Leadership</i>
Technical Quality	.43
Schedule	.29
Cost Performance	.11
Profitability	.35
Speed to Market	.24

Keller (2006)

118 R&D teams and their project leaders

Predictive study (1 year)

Summary: Evidence-based Predictors of Individual Creativity

- **Intelligence** – especially fluid intelligence
- **Divergent thinking**
- **Dominance**
- **Confidence**
- **Achievement orientation**
- **Resourcefulness**
- **Persistence**
- **Resilience, hardiness**
- **Non-conventional**

***Summary:* Evidence-based Predictors of Team Creativity - Composition**

- **High percentage of creative individuals**
- **Resilient, hardy individuals**
- **Some dependable individuals**
- **Some amicable individuals**
- **Job-related diversity**

Summary: Leader Characteristics

- **Transformational leader** – *charismatic, intellectually stimulating, individualized consideration*
- **Participatory style** – *involves all team members, including dissenters; task conflict can be constructive*
- **High-quality interactions (LMX)**
- **Achievement oriented**
- **Comfortable with ambiguity**
- **Willing to take risks**
- **Non-authoritarian**
- **Non-narcissistic**