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Redefining Resiliency using Principles of Social Cognitive Theories to Address the Gap in Training and Assessing Resiliency for Air Carrier Operations

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Patricia Bockelman, Jessica Cruit, Peter Hancock

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We need to talk.





Hello!

We are...

Patricia Bockelman

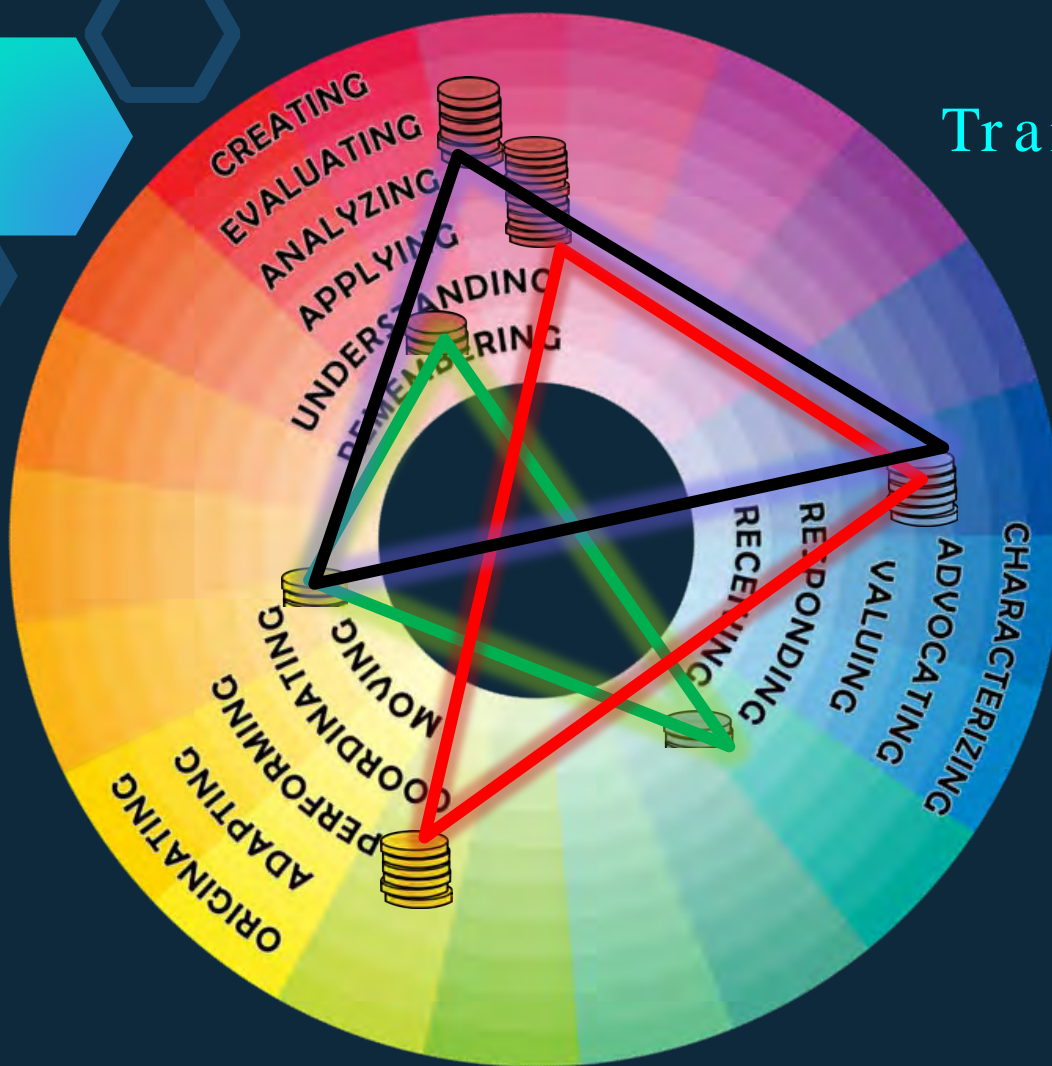
Jessica Cruit

Peter Hancock



Trainers want to know:

- ◇ What KSA combos lead to resilience?
- ◇ How does the demand ratio shift dynamically?
- ◇ Which items should be prioritized for my domain?





1

The way we talk

Influences the path we take



2

There are models

For shared common language



3

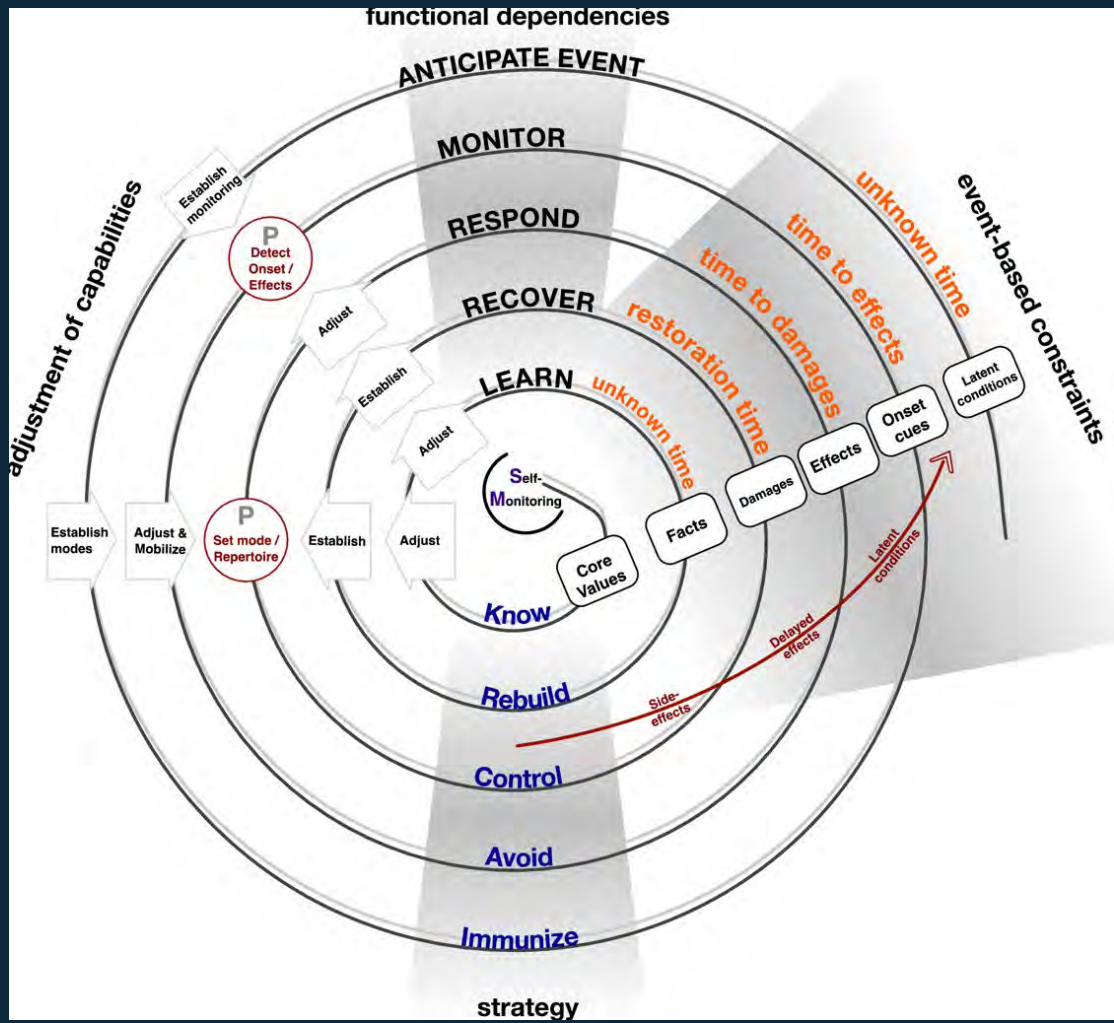
Training Implications

From piecing it together



Close Encounters of the 3rd Kind

Woods (2017) warns us...



Definition of Resilience

Source Domain

“*Resilience* (from *resilio*) a **leaping or skipping back**, a **rebounding**; a going from ones word. *Bac.* The French use *Resiliment* in the same sense.”

Thomas Blount (1618)

The ability of a system, community or society exposed to hazards to **resist, absorb, accommodate** to and **recover** from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

Disaster and Risk Prevention (UNISDR, 2009, p. 24).

Resiliency as a **personal characteristic**. The ability to adapt to, and to **bounce back** from, unexpected events (an idea of effectively returning to baseline/equilibrium).

Matthews et al., 2017

Resiliency is **robustness**, which is the ability of the system to operate within its normal operating boundaries when it is perturbed

Gluck et al., 2012;
Hoffman & Hancock, 2017

“...the regulatory formulations make clear that operational resilience is located at the level of pilot **mental processes (mental flexibility)** and **behavior (performance adaptation)**. Second, that this operational resilience can be improved through training. *Third, there is an interesting use of normative language which is open to interpretation.*”

Bergström, 2019



Semantic - linguistic Analysis

Q1

Can we discover patterns in the way “resilience” is used in language?

Q2

Will semantic clarification assist in a functional clarity of resilience constructs?

Q3

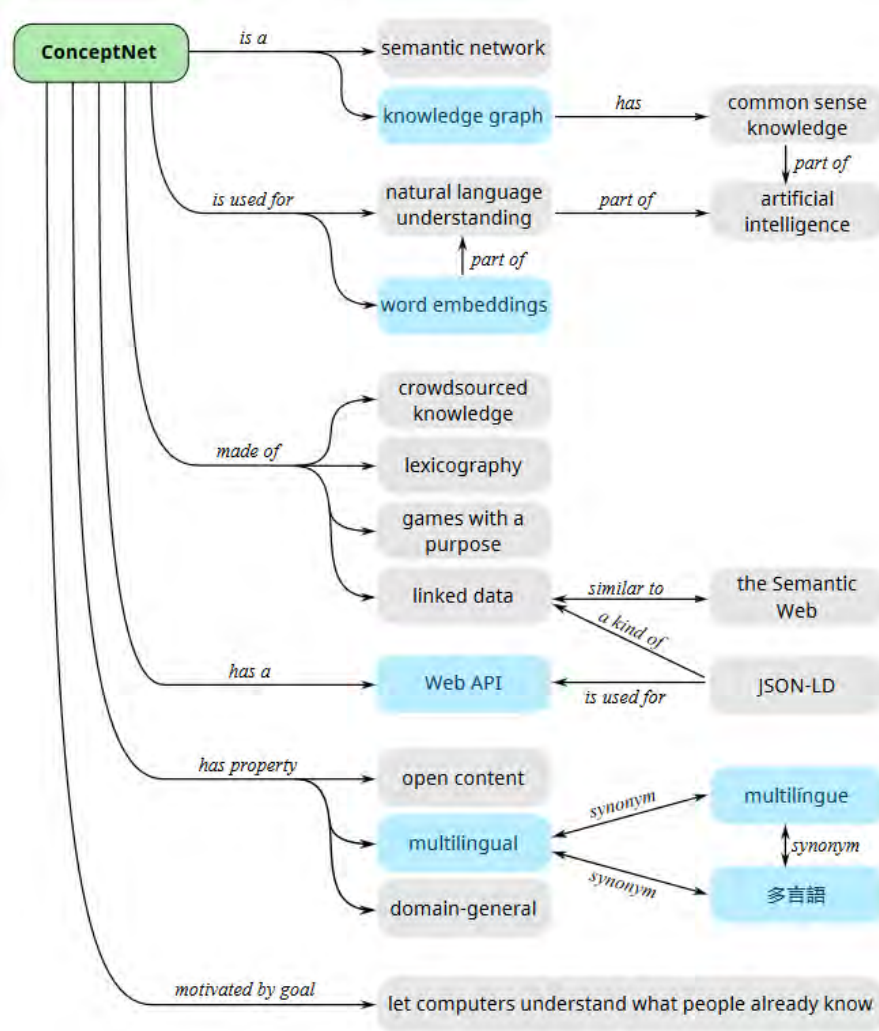
What training implications may be extracted from that clarification system?



ConceptNet

Edges	Similarity weight	Anchor	Analysis source
spirited (a, wn)	— SimilarTo → Weight: 2.0	resilient (a, wn)	Source: Open Multilingual WordNet
elastic (a, wn)	— SimilarTo → Weight: 2.0	resilient (a, wn)	Source: Open Multilingual WordNet





S: (n) [resilience](#), **resiliency** (an occurrence of rebounding or springing back)
[direct hypernym](#) / [inherited hypernym](#) / [sister term](#)
[derivationally related form](#)

S: (n) [resilience](#), **resiliency** (the physical property of a material that can return to its original shape or position after deformation that does not exceed its elastic limit)
[direct hypernym](#) / [inherited hypernym](#) / [sister term](#)

S: (n) [elasticity](#), [snap](#) (the tendency of a body to return to its original shape after it has been stretched or compressed) "*the waistband had lost its snap*"

S: (n) [resilience](#), **resiliency** (the physical property of a material that can return to its original shape or position after deformation that does not exceed its elastic limit)

S: (n) [bounce](#), [bounciness](#) (the quality of a substance that is able to rebound)

S: (n) [give](#), [spring](#), [springiness](#) (the elasticity of something that can be stretched and returns to its original length)

S: (n) [stretch](#), [stretchiness](#), [stretchability](#) (the capacity for being stretched)

S: (n) [temper](#), [toughness](#) (the elasticity and hardness of a metal object; its ability to absorb considerable energy before cracking)

S: (n) [elasticity of shear](#) (the elasticity of a body that has been pulled out of shape by a shearing force)
[derivationally related form](#)

W: (adj) [resilient](#) [Related to: [resilience](#), [resiliency](#)] (elastic; rebounds readily) "*clean bouncy hair*"; "*a lively tennis ball*"; "*as resilient as seasoned hickory*"; "*springy turf*"

W: (v) [resile](#) [Related to: [resilience](#), [resiliency](#)] (return to the original position or state after being stretched or compressed) "*The rubber tubes resile*"

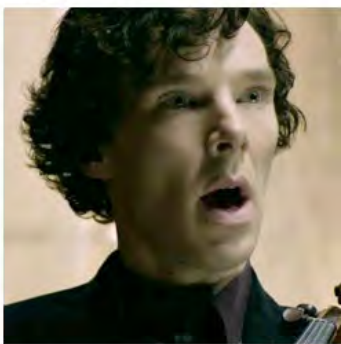
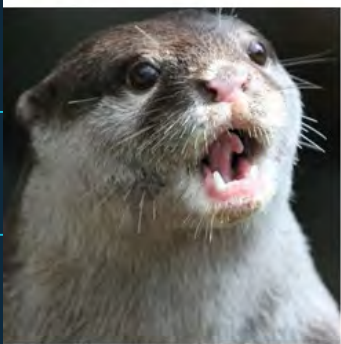


cumberbatch * actor (total ≈ 0.35)



cumberbatch * otter (total ≈ 0.04)





WordNet Search - 3.1

- [WordNet home page](#) - [Glossary](#) - [Help](#)

Word to search for:

Display Options:

Key: "S:" = Show Synset (semantic) relations, "W:" = Show Word (lexical) relations

Display options for sense: (gloss) "an example sentence"

Verb

- [S: \(v\) spirit](#), [spirit up](#), [inspirit](#) (infuse with spirit) *"The company spirited him up"*

Adjective

- [S: \(adj\) spirited](#) (displaying animation, vigor, or liveliness)
- [S: \(adj\) bouncing](#), [bouncy](#), [peppy](#), **spirited**, [zippy](#) (marked by lively action) *"a bouncing gait"; "bouncy tunes"; "the peppy and interesting talk"; "a spirited dance"*
- [S: \(adj\) game](#), [gamy](#), [gamey](#), [gritty](#), [mettlesome](#), **spirited**, [spunky](#) (willing to face danger)
- [S: \(adj\) enlivened](#), **spirited** (made lively or spirited) *"a meal enlivened by the music"; "a spirited debate"*

WordNet Search - 3.1

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Display options for sense: (gloss) "an example sentence"

Adjective

- [S:](#) (adj) **bouncy**, [live](#), [lively](#), [resilient](#), [springy](#) (elastic; rebounds readily) "*clean bouncy hair*"; "*a lively tennis ball*"; "*as resilient as seasoned hickory*"; "*springy turf*"
- [S:](#) (adj) [bouncing](#), **bouncy**, [peppy](#), [spirited](#), [zippy](#) (marked by lively action) "*a bouncing gait*"; "*bouncy tunes*"; "*the peppy and interesting talk*"; "*a spirited dance*"



So, if it's elastic...



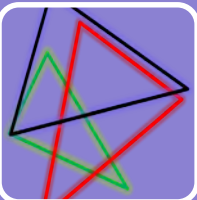
◆ KSA combos
lead to resilience

Identify the factors that
make up specific resilient
behaviors within context



Dynamic shifts in
process

Identify the elements which
constitute the processes of
resilience



Customized
prioritization

Identify the enabling
conditions that elicit resilient
behaviors



A different lens

Can social interaction
constitute social cognition?

(DeJaegher, Di Paolo, Gallagher, 2010)





- ◇ F is a **contextual factor** if variations in F produce variation in X
- ◇ C is an **enabling condition** if the absence of C prevents X from occurring
- ◇ P is a **constitutive element** if P is part of the processes that produce X



Identified Resilient Performance Strategies Employed in Routine Aviation Contexts.

Capability	Strategy
Anticipate	Anticipate procedure limits Anticipate knowledge gaps Anticipate resource gaps Prepare alternate plan and identify conditions for triggering
Monitor	Monitor environment for cues that signal a change from normal operations Monitor environment for cues that signal need to adjust/deviate from current plan Monitor own internal state
Respond	Adjust current plan to accommodate others Adjust or deviate from current plan based on risk assessment Negotiate adjustment or deviation from current plan Defer adjusting or deviating from plan to collect more information Manage available resources Recruit additional resources Manage priorities
Learn	Leverage experience and learning to modify or deviate from plan Understand formal expectations Facilitate others' learning

	verb	object	Contextual Factors	Constitutive Elements	Enabling Conditions
Anticipate	anticipate	procedure (i.e. the limitations of the procedure)	Y	N	N
	prepare	plan	Y	U	N
Monitor	monitor	environment (for change)	Y	Y	Y
	monitor	self	Y	Y	Y
Respond	adjust	plan	Y	Y	N
	accommodate	solution	Y	Y	Y
	manage	resources	Y	Y	Y
	recruit	resources	Y	Y	N
Learn	leverage	experience	Y	Y	Y
	understand	expectations	Y	Y	Y
	facilitate	learning (others)	Y	N	N

-F is a contextual factor if variations in F produce variation in X

-C is an enabling condition if the absence of C prevents X from occurring

-P is a constitutive element if P is part of the processes that produce X

Contextual
Factors

- Because **VARIANCE** in these lead to variance in resilient behaviors...

Vary context to produce variance in resilient behaviors

Constitutive
Elements

- Because these are part of the resilience **PROCESS**...

Observe the demonstration of these elements in trainees


Enabling
Conditions

- Because their **ABSENCE PREVENTS** resilience from occurring...

Inject enabling conditions to elicit resilient behaviors




Recommendations



Expand across R-Domains

Validate across SMEs

Design test protocols for compare






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Woods, D. D. (2017). Essential characteristics of resilience. In *Resilience engineering* (pp. 21-34). CRC Press.

2. Lundberg, J., & Johansson, B. J. (2019). Resilience is not a silver bullet—Harnessing resilience as core values and resource contexts in a double adaptive process. *Reliability Engineering & System Safety* , 188, 110-117.
 3. De Jaegher, H., Di Paolo, E., & Gallagher, S. (2010). Can social interaction constitute social cognition?. *Trends in cognitive sciences* , 14(10), 441-447.
 4. Bergström, J. (2019). The Discursive Effects of Safety Science. *Safety Science Research: Evolution, Challenges and New Directions* , p173.
 5. Speer, R., Chin, J., & Havasi, C. (2017, February). Conceptnet 5.5: An open multilingual graph of general knowledge. In *Thirty-First AAAI Conference on Artificial Intelligence* . <http://conceptnet5.media.mit.edu/>
 6. Princeton University (2010). "About WordNet." WordNet. Princeton University. <https://wordnet.princeton.edu/>
 7. Holbrook, J., Prinzell III, L. J., Stewart, M. J., Smith, B. E., & Matthews, B. L. (2019). Resilience and Safety for In-Time Monitoring, Prediction, and Mitigation of Emergent Risks in Commercial Aviation. In *38th International Symposium on Aviation Psychology* (p. 109).
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Thanks!

Any questions?

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