Can ecologically relevant stimuli improve task performance for people living in poverty?

Hidden Talents in Harsh Environments

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Cognition in Harsh Environments

Deficit Model

Adversity $\xrightarrow{impairs}$ Cognitive Abilities

Hidden Talents Approach

Adversity $\xrightarrow{impairs}$ Cognitive Ability 1

Adversity $\xrightarrow{enhances}$ Cognitive Ability 2

people develop abilities that are **ecologically relevant** to their lived experience

Blair et al., 2011
Bradley & Corwyn, 2002
Farah et al., 2006
Hackman et al., 2014
Ellis et al., 2017
Ellis et al., 2020
Frankenhuis & de Weerth, 2013
Frankenhuis et al., 2020
Executive Functions

Environmental Unpredictability

Adversity

- Impairs Inhibition
- Enhances Shifting
- Enhances Retrieval
- Enhances Updating

Under Economic Uncertainty

- Attention
  (Mittal et al., 2015)

Working Memory

- Updating
  (Although see Nweze et al., 2020)
Attention-Shifting

\[ M_{\text{switch}} - M_{\text{repeat}} = \text{Switch Cost} \text{ (smaller is better)} \]

Friedman et al., 2008
Mittal et al., 2015
Miyake & Friedman, 2012
Working Memory Updating

Proportion Correct (higher is better)
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Current Study

Sample data from a **broad range** of socioeconomic conditions
- Mean age 13.6 ( .8 )
- 43% economically disadvantaged
  - Reduced-price or free lunch
  - Fee waivers
  - Homelessness (N = 32)

Measure **multiple dimensions** of adversity
- Environmental Unpredictability
- Exposure to Violence
- Socioeconomic Status (SES)

Compare performance on tasks with **abstract** versus **ecologically relevant** content
- Attention-Shifting
- Working Memory Updating

Analyze performance using **multiverse analysis**
Ecologically Relevant Content

Attention-Shifting with real-world stimuli

Working Memory Updating with real-world stimuli

Replace abstract content with the real-world content

NimStim library (Tottenham et al., 2009), Radboud Faces Database (Langner et al., 2010).
Multiverse Analysis

Non-Arbitrary
Some alternatives better than others

Arbitrary
Equally defensible alternatives

6 arbitrary data decisions  2 alternatives each  64 possible data sets

Iterate over data performing same analysis

Compile Results
Attention-Shifting

Unpredictability

Violence

SES

Switch Cost (ms)

Adversity: Low, High

Abstract, Real-World

0% of ps < .05

P-Curve

Freq

0 5 10 15

0.0 0.3 0.6 0.9

0.0 0.3 0.6 0.9

0.0 0.3 0.6 0.9
Working Memory Updating

Unpredictability

Violence

SES

% correct

Adversity:
Low
High

Abstract
Real–World

Abstract
Real–World

Abstract
Real–World

P–Curve

Freq

0% of ps < .05
40.62% of ps < .05
53.12% of ps < .05

0.00
0.25
0.50
0.75

0.00
0.25
0.50
0.75

0.00
0.25
0.50
0.75
Can ecologically relevant stimuli improve task performance for people living in poverty?

Not for attention-shifting…

But it does for working memory updating!

Particularly for people exposed to violence and poverty…

At least under some analytic decisions…
Take-Aways

• **Take-aways**
  - Deficits are only one piece of the puzzle
  - People also develop *adaptations* to adverse conditions
  - Both processes may operate *simultaneously*
  - Real-world content may *equalize* performance for people from adversity

• **Multiverse Analysis**
  - *Transparently* and *systematically* unpack your data
  - Provides future research with guidelines for data decisions
  - Come with some pretty cool plots ;)