Stress Less and Remember More: Anxiety Gets Under the Skull

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BACKGROUND

- Past work (e.g., Lachman & Firth, 2004; Mirowsky & Ross, 2007) consistently suggests that control beliefs decline with age. In addition, significant intraindividual variability (IIV) in older adult's control beliefs has been reported (e.g., Bielak et al., 2007).
- There is evidence for a negative association between lower levels of control beliefs and cognitive performance (e.g., Caplan & Schooler, 2003; Hertzog, McGuire, & Lineweaver, 1998; Windsor & Anstey, 2008), and for a mediational role of anxiety and task interference (e.g., Lachman & Agrigoroaei, 2012).
- Higher intraindividual variability (IIV) in control beliefs was a better predictor of mortality than the level of control (Eizenman, Nesselroade, Featherman, & Rowe, 1997).
- Recent findings obtained with a sample of older adults, revealed that general control beliefs and cognitive performance covaried within individuals over time (Neupert & Allaire, 2012). On occasions when participant's beliefs were higher than their average, cognitive performance was also higher.

CURRENT STUDY & QUESTIONS

CURRENT STUDY

- We examined working memory performance and task-specific indicators of control beliefs, anxiety, and distraction across multiple sessions and trials.
- Within each session, the cognitive tasks increased in level of difficulty.

RESEARCH GOALS

AIM 1: ASSOCIATIONS BETWEEN IIV IN MEMORY CONTROL BELIEFS AND ANXIETY, DISTRACTION, AND WORKING MEMORY PERFORMANCE

We expect that those with greater fluctuations in their memory control beliefs would show higher levels of anxiety and distraction, and lower levels of cognitive performance.

AIM 2: WITHIN-PERSON ASSOCIATIONS: ANXIETY AND DISTRACTION AS MEDIATORS OF THE RELATIONSHIP BETWEEN CONTROL BELIEFS AND COGNITIVE PERFORMANCE

We expect that on occasions when people have higher control beliefs - they would experience less anxiety, less distraction, and have better cognitive performance (MEDIATION MODEL).

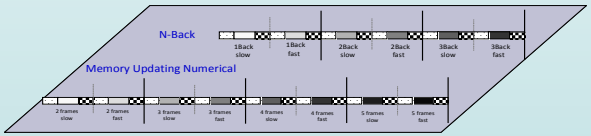
METHOD

PARTICIPANTS

- N = 56; Age: 18- 88; *M* = 47.84; *SD* = 26.24
- 64.3 % Women; Education Attainment: *M* = 15.73 yrs.; *SD* = 2.78

PROCEDURE & MEASURES

4 sessions, about 10 days apart



Cognitive Performance

Two working memory tasks:

N-Back *(e.g., Schmidt et al., 2009)*

- 6 levels of difficulty: 1back, 2back, 3back presented at two levels of speed (slow, fast)

- the final score at each level was the proportion of correct responses corrected for false alarms (A prime, Stanislaw & Todorov, 1999)

Memory Updating Numerical *(Schmiedek et al., 2009)*

- 8 levels of difficulty: 2, 3, 4, & 5 frames presented at two levels of speed (slow, fast)

- the final score at each level was the proportion of correct responses

Self-reports (before/after the cognitive tasks)

Prospective Question:

Control Beliefs

How much control do you think you will have over your performance on this task? 1 (No control) to 5 (Complete control)

Retrospective Questions:

Anxiety

Please rate how anxious you were feeling during the last task

1 (Not at all anxious) to 5 (Very anxious)

Distraction

How much were you distracted during the task?

1 (Not at all) to 5 (Completely)

DATA ANALYSIS & RESULTS

- Multilevel models [measures (6 trials for n-back and 8 trials for memory updating) nested within sessions (4), and nested within participants (56)]
- Low amount of shared variance between the two working memory tasks (1.3%, γ_{10} = .02, t = 2.39, p = .017); therefore separate models were tested for each working memory task
- Index of IIV = within-person SD across all trials (Neupert et al., 2008)
- As indicated by the fully unconditional multilevel models, there was not significant variance at the level of session. Therefore, all multilevel analyses were conducted with trial as Level 1 and persons as Level 2 because significant variance was observed for all variables at both levels.

AIM 1: ASSOCIATIONS BETWEEN IIV IN MEMORY CONTROL BELIEFS AND ANXIETY, DISTRACTION, AND WORKING MEMORY PERFORMANCE

Example model with performance as DV:

Level 1: Performance$_{ti}$ = β_{0ti} + β_{1ti}(Difficulty) + r_{ti}

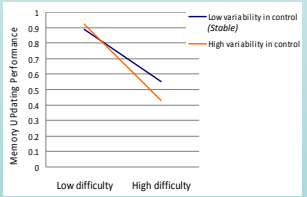
Level 2: β_{0i} = γ_{00} + γ_{01}(Age) + γ_{02}(Average Control) + γ_{03}(IIV Control)+ u_{0i}

Level 2: β_{1i} = γ_{10} + γ_{11}(IIV Control) + u_{1i}

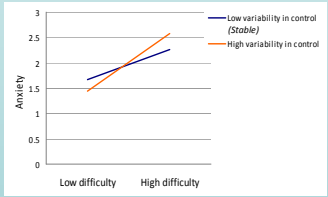
Unstandardized Estimates (and Standard Errors) of Multilevel Models

	N-back Performance	*Memory updating Performance*	*N-back*		*Memory updating*	
			Anxiety	*Distraction*	*Anxiety*	*Distraction*
Intercept, γ_{00}	*1.07***(.01)*	*1.04***(.02)*	*1.18***(.07)*	*1.15***(.08)*	*1.44***(.07)*	*1.21***(.08)*
IIV Control, γ_{03}	*.04*(.02)*	*.11(.08)*	*-.89*** (.22)*	*-.11 (.25)*	*-.49 (.26)*	*-.60* (.28)*
Difficulty, γ_{10}	*-.04***(.003)*	*-.07***(.004)*	*-.19***(.01)*	*.15*** (.01)*	*.12***(.01)*	*.09***(.01)*
Age, γ_{01}	*.0002(.0002)*	*-.001 (.001)*	*.0002 (.003)*	*-.01** (.003)*	*.002 (.003)*	*-.008** (.003)*
Average Control, γ_{02}	*.01 (.01)*	*.03 (.02)*	*-.43***(.07)*	*-.30**(.09)*	*-.39***(.07)*	*-.33***(.08)*
IIV Control X Difficulty, γ_{11}	*-.02*(.01)*	*-.03**(.01)*	*.29***(.03)*	*.11***(.03)*	*.08**(.02)*	*.12***(.02)*

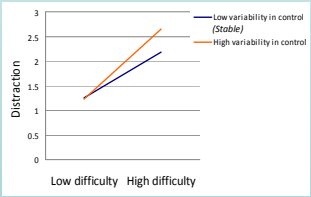
**** p<.001, ** p<.01, * p<.05*



- *People who were more stable (less variable) in their control beliefs were able to maintain higher levels of performance as difficulty increased compared to those who were less stable in their beliefs.*



- *Those who had greater variability in their control beliefs showed a greater increase in anxiety as difficulty increased compared to those who were more stable in their beliefs.*



- *People who were higher in variability in their control beliefs showed greater increase in distraction as difficulty increased compared to those who were more stable in their beliefs.*

AIM 2: WITHIN-PERSON ASSOCIATIONS: ANXIETY AND DISTRACTION AS MEDIATORS OF THE RELATIONSHIP BETWEEN CONTROL BELIEFS AND COGNITIVE PERFORMANCE

- *Results revealed that the within-person relationship between control beliefs and memory updating performance was partially mediated by anxiety (Sobel = -5.38, p <.001) and distraction (Sobel = -6.68, p <.001)*
- *The same pattern was obtained for the within-person relationship between control beliefs and n-back performance: Anxiety (Sobel = -5.29, p <.001); Distraction (Sobel = -6.68, p <.001)*

SUMMARY & CONCLUSIONS

- Irrespective of the level of control, those with greater variability in control beliefs in the face of difficult tasks performed worse and showed greater anxiety and distraction during the task.
- These patterns were obtained for both working memory tasks, irrespective of age.
- Stability that is low IIV in subjective control beliefs was associated with better objective memory performance and may serve a protective function in the face of challenging tasks.
- Changes in anxiety and distraction play a mediational role in the within-person relationship between control beliefs and memory performance.

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