



Measuring Stigma's Effects on Neuronal Indices of Error Perception and Interpretation in Psychologically Disengaged Minorities

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Introduction

Research on psychological disengagement suggests that minority students cope with the threat of negative intellectual stereotypes by psychologically disengaging from test feedback (Major & Schmader, 1998; Major, Spencer, Schmader, Wolfe, & Crocker, 1998; Aronson & Inzlicht, 2004). Although this strategy might buffer self-esteem (Major et al., 1998), psychological disengagement is thought to have deleterious consequences for motivation and performance. To date however, little is known about the mechanisms that underlie the process.

For example, if psychological disengagement is associated with distancing oneself from a stigmatized task, do psychologically disengaged minorities attend to negative feedback in an intellectually threatening environment and if so, how is it evaluated? To answer this question, we utilized a social neuroscience approach by examining the anterior cingulate cortex, a region of the brain widely implicated in error monitoring and feedback evaluative processes.

The Anterior Cingulate Cortex (ACC) and Feedback Evaluation:

The ACC is active when someone is engaged in a goal directed behavior or a discrepancy occurs between personal expectations and an outcome (Dehaene, Posner, & Tucker, 1994; Hajcak, McDonald, & Simons, 2003). One neuronal index of anterior cingulate activity, known as feedback related negativity (FRN), has been implicated in the quick binary (good/bad) evaluation of feedback (Luu, et al., 2003). In addition the P300 elicited in response to negative feedback has been utilized as a measure of attention paid to the feedback (Comerchero & Polich, 1999). These ERPs could serve as on-line indices of the degree to which psychologically disengaged minorities attend to (P300) and evaluate (FRN) error feedback received in an intellectually threatening environment.

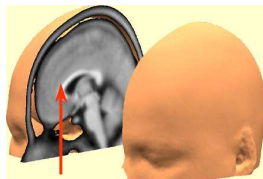


Image from <http://www.gehringlab.org/research.html>

Rationale for Hypotheses:

Nussbaum and Steele (2007) have argued that stigmatized minorities might psychologically disengage during an intellectually threatening task as a means of reducing threat and maintaining persistence at the task. In addition, individuals are more likely to attribute their negative outcomes to situational variables than to internal ones (Malle, 2006). Together, this suggests that situational disengagement may facilitate greater task persistence and a need for stigmatized minorities to attend to negative feedback so that the failure implied can be attributed externally, e.g. to a biased IQ test.

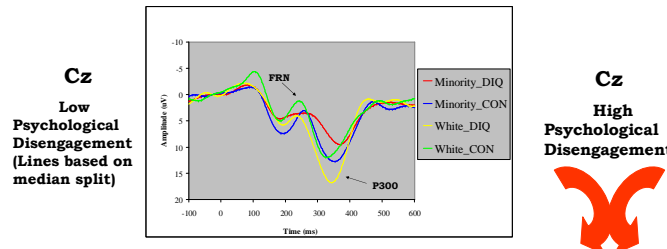
Methods

- 96 undergraduates (36 Latino, 17 Black, 48 White) participated for credit or money
- Psychological disengagement (assessed post-task, $\alpha = .66$; Major & Schmader, 1998): e.g. "No intelligence test will ever change my opinion of how intelligent I am."
- Between Subjects Design:
 - Ethnicity: Minority vs. White
 - Disengagement (continuous: Engaged vs. Disengaged)
 - Task description: pattern recognition task (Non-diagnostic of intelligence=CON) vs. intelligence test (Diagnostic of intelligence=DIQ)
- Procedure
 - Continuous EEG activity was recorded at 100Hz from 32 channels during tasks
 - Baseline: 320 trials of Eriksen-Flankers task (a task that induces response conflict)
 - Manipulation: Description of task diagnosticity varied
 - 480 trials of the Eriksen-Flankers task
 - Post-task questionnaire
- DVs: - FRN & P300 amplitudes elicited in response to "WRONG" feedback
 - Reaction times on error and correct trials; number of errors made
 - Self-doubt and anxiety rated after the task (e.g. *insecure*, *anxious*, $\alpha = .94$)

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Handouts available at: www.psychofizz.org

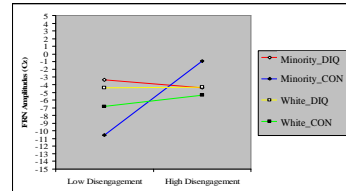
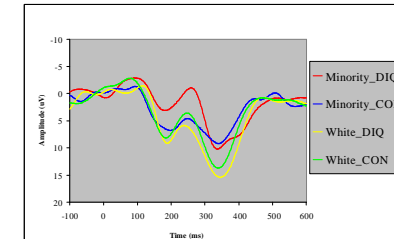
Hypotheses and Results

Hypothesis 1: When minority participants are placed in an intellectually threatening environment, those who psychologically disengage will elicit smaller FRN amplitudes and possibly larger P300 amplitudes in response to negative feedback compared to engaged minorities.

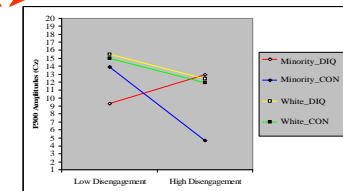


Cz
Low Psychological Disengagement (Lines based on median split)

Cz
High Psychological Disengagement

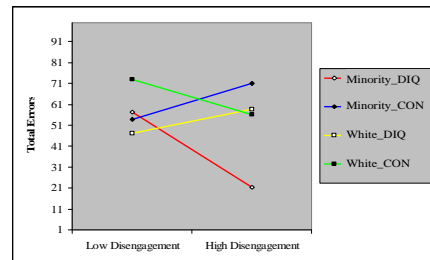


3-way interaction, $\beta = -.35$, $t(88) = -2.11$, $p < .04$. Psychologically disengaged minorities exhibit comparable FRN amplitudes to other groups only when task is linked to IQ.



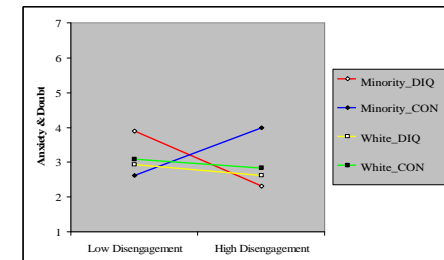
3-way interaction, $\beta = .39$, $t(88) = 2.41$, $p < .02$. When task linked to IQ, psychologically disengaged minorities elicit larger P300 amplitudes compared to disengaged minorities in the control condition

Hypothesis 2: In the DIQ condition, psychologically disengaged minorities will make fewer errors than engaged minorities.



3-way interaction (adjusting for baseline errors), $\beta = -.26$, $t(87) = -2.00$, $p = .05$. Psychologically disengaged minorities tended to make fewer errors than their control and engaged counterparts when task linked to IQ (note y-axis displays raw values).

Hypothesis 3: In the DIQ condition, psychologically disengaged minorities will report feeling less anxiety and doubt.



3-way interaction, $\beta = -.42$, $t(88) = -2.46$, $p < .02$. Psychologically disengaged minorities in DIQ condition tended to report less doubt and anxiety than their control and engaged counterparts.

Other analyses: Reaction time analyses revealed an overall tendency for minorities to exhibit slower RTs on error trials and for the psychologically disengaged (regardless of race) to exhibit less post-error slowing in the DIQ condition.

Conclusions

- Among psychologically disengaged minorities, the default response was a more neutral evaluation of error feedback as indexed by smaller FRN amplitudes. When the task was linked to intelligence however, psychologically disengaged minorities evaluated error feedback more negatively and equal to that of psychologically engaged minorities and Caucasians.
- Compared to psychologically engaged minorities in the DIQ condition and psychologically disengaged minorities in the control condition, psychologically disengaged minorities in the DIQ condition paid more attention to negative feedback as indexed by larger P300 amplitudes.
- Despite this, psychologically disengaged minorities reported feeling less anxiety and doubt in the DIQ condition and tended to commit fewer errors as well.
- These findings suggest that negative feedback received in intellectually threatening environments may be defused by psychologically disengaged minorities not at the time of the initial evaluation of the feedback (FRN), but subsequently (P3) via an attention demanding process. These findings would be consistent with a hypothesis that a defensive response is utilized that takes the form of overt confidence and self affirmation (e.g. affirming they are intelligent despite just receiving feedback that may challenge that belief).

References

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- * A univariate ANOVA on post-task ratings of disengagement revealed no effects for condition or race p 's > .25
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