THE INFLUENCE OF NEGATIVE AFFECT REGULATION AND NEUROPHYSIOLOGICAL MARKERS OF COGNITIVE CONTROL ON DISTRESS TOLERANCE

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Abstract

As NASA pursues longer-duration crewed missions, an increased understanding of psychological resilience in high-stress environments will become vital to maintaining human performance. The ability to withstand negative emotions has been associated with mental health outcomes and should be considered during the assessment and training of astronaut candidates. Emotion regulation and cognitive control have individually been associated with distress tolerance, but inconsistent measurement and task demands have left the cognitive-affective mechanisms of distress tolerance unclear. This study aims to elucidate the relationship between neurophysiological markers of cognitive control, emotion regulation ability, and distress tolerance. Undergraduate students completed self-report measures of distress tolerance and emotion regulation in addition to a behavioral task assessing cognitive control. The Go-NoGo task was used to elicit a neurophysiological marker of cognitive control known as the anterior N2 through response inhibition. It was hypothesized that N2 would moderate the relationship between emotion regulation and distress tolerance. Findings indicated a significant predictive effect of emotion regulation on distress tolerance and a non-significant small effect for the N2 predicting distress tolerance. Results indicate that emotion regulation may represent a valuable target for adapted selection, training, and intervention to ensure adequate distress tolerance is identified in crew members.

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As NASA expands its crewed space program to include long-duration missions with greater degrees of isolation and delay in communication, psychological resilience during transit and habitation periods will be essential to mission success (Alfano et al., 2018). Current candidate suitability proficiencies include, among other items, the ability to regulate emotional states and perform under stressful conditions (Sgobba et al., 2018). However, to identify and train individuals that will retain high levels of functionality under the demands of long-term space travel, the mechanisms of individual differences in resilience must first be understood.

Distress tolerance, or the ability to withstand negative affect in pursuit of a goal (Leyro et al., 2010). is imperative for psychological health and coping under stressful conditions (Hawkins et al., 2013). Low distress tolerance is a transdiagnostic vulnerability factor for a wide range of psychopathology, the occurrence of which could increase psychological distress, jeopardize mission success, and hinder crew teamwork dynamics. Internalizing disorders such as anxiety disorders (Keough et al., 2010; Michel et al., 2016), depression (Benfer et al., 2017; Williams et al., 2013), and posttraumatic stress disorder (Vujanovic et al., 2011) are most commonly associated with low distress tolerance. The presentation of externalizing disorders in individuals with low distress tolerance such as substance use disorders (Allan et al., 2015), eating disorders (Anestis et al., 2012), non-suicidal self-injury (Slabbert et al., 2018), and suicidality (Anestis et al., 2013) may also be influenced by poor coping strategy use in response to emotional distress.

Emotion regulation is related to distress tolerance (Jeffries et al., 2016; Naragon-Gainey et al., 2017) and independently predictive of mental health outcomes (Bonanno & Burton, 2013). Additionally, the adaptive use of self-regulation strategies is associated with stronger social bonds (Gross & John, 2003) which may assist with team dynamics. Emotional regulation can also promote cooperation and cohesive team functioning through interpersonal control of negative affect (Barthel et al., 2018).

Interestingly, self-report measures of distress tolerance and emotion regulation are more predictive of mental health outcomes than behavioral measures (Gross, 2014; Kiselica et al., 2015). This predictive ability is thought to demonstrate the impact of self-efficacy on both performance and willingness to use emotional coping strategies. Decreased use of adaptive coping strategies would likely negatively impact overall emotional well-being, further perpetuating the perception of low emotional coping abilities (Kneeland et al., 2016). Additionally, it has been noted that that the measurement of distress tolerance is currently consistent only across domain-specific self-report measures (i.e. negative affect tolerance) and the use of behavioral tasks to measure distress tolerance add additional cognitive demands (McHugh & Otto, 2012; Veilleux et al., 2019)

The regulation and tolerance of high-intensity emotions increase cognitive demand (Langeslag & Surti, 2017; Ortner et al., 2016), thus decreasing cognitive resources available for the performance of mission duties.

Low distress tolerance may be predicted by poor cognitive control as indicated by difficulty inhibiting a prepotent emotional response despite a known conflict with an alternative response that may be more conducive to a long-term goal (Marshall et al., 2011). Prolonged attention to negative emotion, which may be indicative of poor attentional control and shifting abilities (Macatee, McDermott, Albanese, et al., 2018), also increases subjective distress levels and decreases tolerance to negative emotions (Benfer et al., 2017) particularly when appropriate regulatory strategies are not used (Hajcak et al., 2006).

Individual distress tolerance is related to cognitive control even when accounting for the level of negative affect (Macatee, Albanese, Clancy, et al., 2018). Higher distress tolerance may decrease emotional regulation's cognitive demands and increase functionality by creating a higher threshold at which emotions become distressing enough to require regulation. Similarly, effectual cognitive control and emotion regulation abilities may increase an individual's perception and self-efficacy of their ability to tolerate negative emotions.

While self-reported perceived distress tolerance and emotion regulation are appropriate measures in a mental health context, cognitive control assessment is more varied. One such measure, the anterior N2 event-related potential (ERP) component, uses stimulus-locked neurophysiological responses to assess attention, conflict monitoring, and response inhibition (Rietdijk et al., 2014). The anterior N2 is closely followed by the P3 component associated with attention orienting to novel or significant stimuli (Folstein & Van Petten, 2008).

In the context of cognitive control for response inhibition, the anterior N2 would be display attention to and recognition of conflict between a prepotent and desired response (Feldman & Freitas, 2019). The extant literature regarding the relationship between cognitive control and distress tolerance has been inconsistent in part due to methodological differences such as measurement type and cognitive task demands.

Zhou and colleagues (2015) decreased cognitive task demands to analyze inhibitory motor control using the N2 component in a behavioral task. However, this paradigm was limited by the assumption that motor and premotor inhibitory control are the primary aspects of cognitive control represented by N2 amplitude changes in early processing. Macatee, Albanese, Clancy, et al. (2018) used a complex Go-NoGo task with attentional and conflict monitoring cognitive demands to detect neurophysiological markers of differences in distress intolerance. However, these results used a clinical sample and were confounded by the task's working memory component.

This study aims to elucidate the relationship between neurophysiological markers of cognitive control, emotion regulation ability, and distress tolerance, leading to a greater understanding of cognitive-affective processing imperative for team cohesion, individual mental health, and ultimately mission success. It is hypothesized that the anterior N2 will predict distress tolerance during a simple Go-NoGo task. It is further expected that cognitive control will moderate the relationship between emotion regulation and distress tolerance and may represent a valuable target for adapted selection, training, and intervention in astronauts.

Method

Participants

The sample was comprised of 53 undergraduate students (mean age = 20.57, SD = 3.74) completing the study for research credit. Exclusion criteria included being under 18 years of age. Of the 59 participants that completed the Go-NoGo task, two were excluded due to missing EEG data, and five were excluded due to missing survey data. Participants were primarily female (71%, n = 38), White (50.9%, n = 27) and non-Hispanic (81.1%, n = 43). The sample was 13.2% Black (n = 7), 9.4% Latino/a (n = 5), 1.9% Asian (n = 1), and 24.5% Multiracial (n = 13). Participants completed self-report questionnaires followed by behavioral tasks while monitoring electroencephalographic (EEG) and electrocardiographic (ECG) responses.

Self-Report Measures

Distress Tolerance Scale

The Distress Tolerance Scale (DTS; Simons & Gaher, 2005) is a measure of the perceived ability to withstand negative affect and emotional distress. Individuals completing the 15-item questionnaire used a 5-point Likert scale from 1 (strongly agree) to 5 (strongly disagree). The DTS consists of four subscales assessing tolerance, absorption, regulation, and appraisal. One item is reverse-scored, and higher summed total scores are indicative of greater perceived distress tolerance.

Difficulties in Emotion Regulation Scale-Short Form

The Difficulties in Emotion Regulation Scale-Short Form (DERS-SF; Kaufman et al., 2015) assesses the ability to regulate negative emotional states. This 18-item questionnaire asks participants to rate orientation and responses to negative emotions on a 5-point scale from 1 = almost never (0-10%) to 5 = almost always (91-100%). The DERS-SF includes six subscales related to difficulties with regulatory strategy use, non-acceptance, impulsivity, goal-directedness, emotional awareness, and emotional clarity. The awareness items are reverse scored and items are summed to get subscale and total scores with higher scores indicating greater perceived difficulty with emotion regulation.

Behavioral Measure

Go-NoGo Task/N2 ERP Component

The behavioral task measuring cognitive control was the Go-NoGo task. This task primarily measures cognitive control through inhibitory response regulation and attentional control. Participants respond with a button-press to three differently oriented Gabor patches (0, 45, 90, and 135 degrees) but are instructed not to respond to one orientation (counter-balanced). The anterior N2 ERP component is reliably evoked by this task at approximately 200 ms following the stimulus presentation and is measured in the Fz, FCz, and Cz electrodes (Rietdijk et al., 2014). As the anterior N2 is greater during the NoGo stimulus, a minimum of 30 NoGo trials is recommended for internal consistency purposes (Leue et al., 2013). The present study included approximately 240 total trials with approximately 60 (25%) NoGo trials. Variation in the final trial numbers due to stimulus randomization and artifact rejection procedures did not result in less than 30 trials per participant.

Data Processing

EEG data were collected using the ActiveTwo BioSemi system referenced online at the mastoid electrodes and offline as the average of all electrodes. A 0.1 Hz high-pass filter was used to decrease the influence of skin conductance on neural recordings. Independent component analysis (ICA) was then conducted to correct for eye-blink artifacts. Epochs of trials were taken from -200 ms to 800 ms with the stimulus presentation at zero. Artifact rejection criteria excluded trials with blinks within 200 ms of stimulus presentation and extreme values or flatlining EEG signals. Initial processing of ERP data in which mean amplitudes and N2 grand average components were averaged across NoGo trials and Go trials for each participant (see Figure 1). The N2 waveforms revealed a P3 influencing the visibility of the anterior N2, thus a principal components analysis (PCA) was also run.

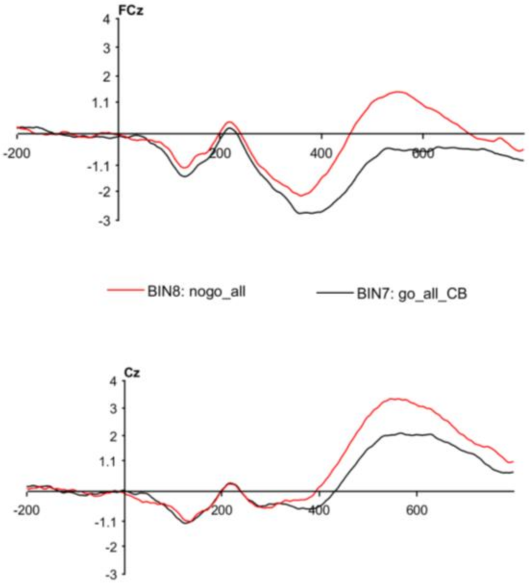

Figure 1. Grand-averaged ERPs for Go and NoGo trials at FCz and Cz.

Principal Components Analysis

A two-step PCA was used to separate the waveform into factors and parse the N2 from the P3 component. A temporal PCA using Promax rotation and Horn's parallel analysis found 18 factors accounting for 91% of the variance. A spatial PCA was then conducted using Infomax rotation on each factor. Horn's parallel analysis found three spatial factors for each of the 18 temporal factors accounting for 77% of the variance. Based on peak latency, location, and modulation by stimuli, one factor at FCz with a peak latency of 443 ms was identified as a P3 candidate, and three factors were identified as candidates for the N2. The first factor was maximal at FCz and 118 ms, the second at Cz at 220 ms, and the third at Cz at 289 ms. The N2 factor at 220 ms was chosen as the primary candidate due to latency and modulation with Go/NoGo stimuli (see Figure 2.). All four candidate factor scores and loadings were rescaled to microvolts, and mean amplitude measurements were centered around the factor peak (Dien, 2012).

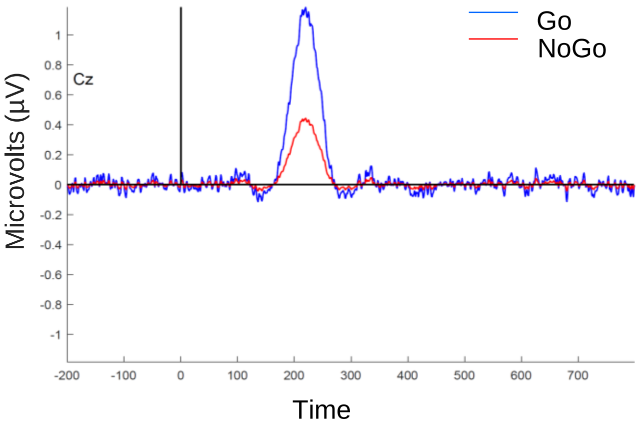

Figure 2. An N2 latent ERP candidate use found using temporospatial PCA.

Statistical Analysis

Analysis was performed using the primary N2 factor candidate. A difference in mean amplitude was found by subtracting the NoGo trial mean amplitudes from the Go trial mean amplitudes. A moderation analysis was run in SPSS v.26 (IBM Corp., 2017) using 10,000 sample bias-corrected bootstrapping. Difference wave amplitude representative of the N2 and emotion regulation scores were used to predict distress tolerance scores, and interactive effects were evaluated.

Results

The model accounted for 40.6% of the variance in distress tolerance. Difficulties with emotion regulation (M = 38.85, SD = 14.39) significantly predicted distress tolerance (M = 51.06, SD = 12.28), B = -0.56, $p < .001$, $f^2 = .67$. The N2 indicated by the difference wave mean amplitude (M = -0.86, SD = 3.36) did not significantly predict distress tolerance, B = 2.54, p = .069, f^2 = 0.04. A significant interactive effect was not found, B = -0.06, p = .103, f^2 = 0.03. A power analysis with .80 power and the alpha level set at .05 using G*Power 3.1 (Erdfelder et al., 2009) found that 55 participants would be required to find a medium effect size (Cohen's f^2 of 0.15).

Discussion

This study proposed that cognitive control may moderate the relationship between emotion regulation and distress tolerance. Consistent with previous literature, emotion regulation was found to predict distress tolerance. This finding indicates the potential utility of emotion regulation as a target for distress tolerance training. Though the mechanism of this relationship is unknown, it is possible that decreased frequency of emotion regulation strategy use and lack of confidence in regulatory capabilities decreases an individual's perceived distress tolerance by negatively impacting their coping self-efficacy (Kneeland et al., 2016).

Cognitive control was not found to predict distress tolerance. Given the small effect sizes found, the study was likely too underpowered to detect an effect of cognitive control. The interactive effect also yielded a non-significant small effect size, likely due to the study being underpowered. Findings interpreted in light of the small effect size may indicate that the N2 influences distress tolerance. However, a larger sample size will be required to confirm the effects. Additionally, given the discrepancy in variance accounted for by emotion regulation and cognitive control, emotion regulation may be a more beneficial target for assessment and training in increasing distress tolerance.

Both hot and cold cognitive control have been found to influence emotion regulation (Gutiérrez-Cobo et al., 2017; Hayes et al., 2010; Leshem & Yefet, 2019), but distress tolerance has received less attention. Future studies may wish to evaluate cold (i.e. non-emotive task) compared to hot (i.e. emotive task) cognitive control using tasks that incorporate emotional elements for predicting distress tolerance.

Findings have demonstrated a means by which future research can more directly assess the effects of spaceflight on the integrity of cognitive-affective processing and provide a more informed picture of protective factors indicative of mission readiness. Further elucidating mechanistic processing related to crew mental health will continue to allow for the development and application of more robust tests of candidate suitability criteria and training protocols that will increase individual psychological well-being and team dynamics.

Acknowledgments

This project was supported by the Virginia Space Grant Consortium Graduate STEM Research Fellowship. The author would like to acknowledge the undergraduate research assistants in the Old Dominion University Emotion Research and Psychophysiology Lab for work in data collection. The author would also like to express gratitude to Matt R. Judah for acting as project advisor and ERP expert.

References

Alfano, C. A., Bower, J. L., Cowie, J., Lau, S., & Simpson, R. J. (2018). Long-duration space exploration and emotional health: Recommendations for conceptualizing and evaluating risk. In *Acta Astronautica* (Vol. 142, pp. 289–299). Elsevier Ltd. https://doi.org/10.1016/j.actaastro.2017.11.009

Allan, N. P., Macatee, R. J., Norr, A. M., Raines, A. M., & Schmidt, N. B. (2015). Relations between common and specific factors of anxiety sensitivity and distress tolerance and fear, distress, and alcohol and substance use disorders. *Journal of Anxiety Disorders*, *33*, 81–89. https://doi.org/10.1016/j.janxdis.2015.05.002

Anestis, M. D., Lavender, J. M., Marshall-Berenz, E. C., Gratz, K. L., Tull, M. T., & Joiner, T. E. (2012). Evaluating distress tolerance measures: Interrelations and associations with impulsive behaviors. *Cognitive Therapy and Research*. https://doi.org/10.1007/s10608-011-9377-8

Anestis, M. D., Pennings, S. M., Lavender, J. M., Tull, M. T., & Gratz, K. L. (2013). Low distress tolerance as an indirect risk factor for suicidal behavior: Considering the explanatory role of non-suicidal self-injury. *Comprehensive Psychiatry*, *54*(7), 996–1002. https://doi.org/10.1016/j.comppsych.2013.04.005

Barthel, A. L., Hay, A., Doan, S. N., & Hofmann, S. G. (2018). Interpersonal Emotion Regulation: A Review of Social and Developmental Components. *Behaviour Change*, *35*(4). https://doi.org/10.1017/bec.2018.19

Benfer, N., Bardeen, J. R., & Fergus, T. A. (2017). The interactive effect of attention to emotions and emotional distress intolerance on anxiety and depression. *Journal of Cognitive Psychotherapy*, *31*(2), 91–100. https://doi.org/10.1891/0889-8391.31.2.91

Bonanno, G. A., & Burton, C. L. (2013). Regulatory Flexibility: An Individual Differences Perspective on Coping and Emotion Regulation. *Perspectives on Psychological Science*, *8*(6), 591–612. https://doi.org/10.1177/1745691613504116

Dien, J. (2012). Applying principal components analysis to event-related potentials: A tutorial. *Developmental Neuropsychology*, *37*(6), 497–517. https://doi.org/10.1080/87565641.2012.697503

Feldman, J. L., & Freitas, A. L. (2019). An Analysis of N2 Event-Related-Potential Correlates of Sequential and Response-Facilitation Effects in Cognitive Control. *Journal of Psychophysiology*, *33*(2), 85–95. https://doi.org/10.1027/0269-8803/a000212

Folstein, J. R., & Van Petten, C. (2008). Influence of cognitive control and mismatch on the N2 component of the ERP: A review. In *Psychophysiology* (Vol. 45, Issue 1, pp. 152–170). Blackwell Publishing Inc. https://doi.org/10.1111/j.1469-8986.2007.00602.x

Gross, J. J. (2014). Emotion Regulation: Conceptual and empirical foundations. In *Handbook of Emotion Regulation* (Second Edi, pp. 3–20). Guilford Publications.

Gross, J. J., & John, O. P. (2003). Individual Differences in Two Emotion Regulation Processes: Implications for Affect, Relationships, and Well-Being. *Journal of Personality and Social Psychology*, *85*(2), 348–362. https://doi.org/10.1037/0022-3514.85.2.348

Gutiérrez-Cobo, M. J., Cabello, R., & Fernández-Berrocal, P. (2017). The three models of emotional intelligence and performance in a hot and cool go/no-go task in undergraduate students. *Frontiers in Behavioral Neuroscience*, *11*. https://doi.org/10.3389/fnbeh.2017.00033

Hajcak, G., Moser, J. S., & Simons, R. F. (2006). Attending to affect: Appraisal strategies modulate the electrocortical response to arousing pictures. *Emotion*, *6*(3), 517–522. https://doi.org/10.1037/1528-3542.6.3.517

Hawkins, K. A., Macatee, R. J., Guthrie, W., & Cougle, J. R. (2013). Concurrent and prospective relations between distress tolerance, life stressors, and anger. *Cognitive Therapy and Research*, *37*(3), 434–445. https://doi.org/10.1007/s10608-012-9487-y

Hayes, J. P., Morey, R. A., Petty, C. M., Seth, S., Smoski, M. J., McCarthy, G., & LaBar, K. S. (2010). Staying Cool when Things Get Hot: Emotion Regulation Modulates Neural Mechanisms of Memory Encoding. *Frontiers in Human Neuroscience*, *4*, 230. https://doi.org/10.3389/fnhum.2010.00230

Jeffries, E. R., McLeish, A. C., Kraemer, K. M., Avallone, K. M., & Fleming, J. B. (2016). The Role of Distress Tolerance in the Use of Specific Emotion Regulation Strategies. *Behavior Modification*, *40*(3), 439–451. https://doi.org/10.1177/0145445515619596

Kaufman, E. A., Xia, M., Fosco, G., Yaptangco, M., Skidmore, C. R., & Crowell, S. E. (2015). The Difficulties in Emotion Regulation Scale Short Form (DERS-SF): Validation and Replication in Adolescent and Adult Samples. *Journal of Psychopathology and Behavioral Assessment*, *38*(3). https://doi.org/10.1007/s10862-015-9529-3

Keough, M. E., Riccardi, C. J., Timpano, K. R., Mitchell, M. A., & Schmidt, N. B. (2010). Anxiety Symptomatology: The Association With Distress Tolerance and Anxiety Sensitivity. *Behavior Therapy*, *41*(4), 567–574. https://doi.org/10.1016/j.beth.2010.04.002

Kiselica, A. M., Rojas, E., Bornovalova, M. A., & Dube, C. (2015). The Nomological Network of Self-Reported Distress Tolerance. *Assessment*, *22*(6), 715–729. https://doi.org/10.1177/1073191114559407

Kneeland, E. T., Dovidio, J. F., Joormann, J., & Clark, M. S. (2016). Emotion malleability beliefs, emotion regulation, and psychopathology: Integrating affective and clinical science. In *Clinical Psychology Review* (Vol. 45). https://doi.org/10.1016/j.cpr.2016.03.008

Langeslag, S. J. E., & Surti, K. (2017). The effect of arousal on regulation of negative emotions using cognitive reappraisal: An ERP study. *International Journal of Psychophysiology*, *118*, 18–26. https://doi.org/10.1016/j.ijpsycho.2017.05.012

Leshem, R., & Yefet, M. (2019). Does impulsivity converge distinctively with inhibitory control? Disentangling the cold and hot aspects of inhibitory control. *Personality and Individual Differences*, *145*, 44–51. https://doi.org/10.1016/j.paid.2019.03.003

Leyro, T. M., Zvolensky, M. J., & Bernstein, A. (2010). Distress Tolerance and Psychopathological Symptoms and Disorders: A Review of the Empirical Literature Among Adults. *Psychological Bulletin*, *136*(4), 576–600. https://doi.org/10.1037/a0019712

Macatee, R. J., Albanese, B. J., Clancy, K., Allan, N. P., Bernat, E. M., Cougle, J. R., & Schmidt, N. B. (2018). Distress intolerance modulation of neurophysiological markers of cognitive control during a complex Go/No-Go task. *Journal of Abnormal Psychology*, *127*(1), 12–29. https://doi.org/10.1037/abn0000323

Macatee, R. J., McDermott, K. A., Albanese, B. J., Schmidt, N. B., & Cougle, J. R. (2018). Distress Intolerance Moderation of Attention to Emotion: An Eye-Tracking Study. *Cognitive Therapy and Research*, *42*(1), 48–62. https://doi.org/10.1007/s10608-017-9869-2

McHugh, R. K., & Otto, M. W. (2012). Refining the Measurement of Distress Intolerance. *Behavior Therapy*, *43*(3), 641–651. https://doi.org/10.1016/j.beth.2011.12.001

Michel, N. M., Rowa, K., Young, L., & McCabe, R. E. (2016). Emotional distress tolerance across anxiety disorders. *Journal of Anxiety Disorders*, *40*, 94–103. https://doi.org/10.1016/j.janxdis.2016.04.009

Naragon-Gainey, K., McMahon, T. P., & Chacko, T. P. (2017). The structure of common emotion regulation strategies: A meta-analytic examination. *Psychological Bulletin*, *143*(4), 384–427. https://doi.org/10.1037/bul0000093

Ortner, C. N. M., Marie, M. S., & Corno, D. (2016). Cognitive costs of reappraisal depend on both emotional stimulus intensity and individual differences in habitual reappraisal. *PLoS ONE*, *11*(12). https://doi.org/10.1371/journal.pone.0167253

Rietdijk, W. J. R., Franken, I. H. A., & Thurik, A. R. (2014). Internal consistency of event-related potentials associated with cognitive control: N2/P3 and ERN/Pe. *PLoS ONE*, *9*(7). https://doi.org/10.1371/journal.pone.0102672

Sgobba, T., Landon, L., Marciacq, J.-B., Groen, E., Tikhonov, N., & Torchia, F. (2018). Space Safety and Human Performance. In *Space Safety and Human Performance* (pp. 721–793). Elsevier.

Simons, J. S., & Gaher, R. M. (2005). The distress tolerance scale: Development and validation of a self-report measure. *Motivation and Emotion*, *29*(2), 83–102. https://doi.org/10.1007/s11031-005-7955-3

Slabbert, A., Hasking, P., & Boyes, M. (2018). Riding the emotional roller coaster: The role of distress tolerance in non-suicidal self-injury. *Psychiatry Research*, *269*, 309–315. https://doi.org/10.1016/j.psychres.2018.08.061

Veilleux, J. C., Pollert, G. A., Zielinski, M. J., Shaver, J. A., & Hill, M. A. (2019). Behavioral Assessment of the Negative Emotion Aspect of Distress Tolerance: Tolerance to Emotional Images. *Assessment*, *26*(3), 386–403. https://doi.org/10.1177/1073191116689819

Vujanovic, A. A., Bonn-Miller, M. O., Potter, C. M., Marshall, E. C., & Zvolensky, M. J. (2011). An evaluation of the relation between distress tolerance and posttraumatic stress within a trauma-exposed sample. *Journal of Psychopathology and Behavioral Assessment*, *33*(1), 129–135. https://doi.org/10.1007/s10862-010-9209-2

Williams, A. D., Thompson, J., & Andrews, G. (2013). The impact of psychological distress tolerance in the treatment of depression. *Behaviour Research and Therapy*, *51*(8), 469–475. https://doi.org/10.1016/j.brat.2013.05.005

Zhou, S., Kemp, J., Després, O., Pebayle, T., & Dufour, A. (2015). The association between inhibition and pain tolerance in the elderly: Evidence from event-related potentials. *European Journal of Pain*, *19*(5), 669–676. https://doi.org/10.1002/ejp.588