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14. ABSTRACT Blue light exposure shows promise as a safe and easily implemented intervention to improve attention, increase cognitive functioning and enhance mood. However, the exact mechanism that explains these beneficial effects is currently unknown, hindering the ability to make effective recommendations to military personnel regarding its optimal use. We studied acute exposure to blue light or an amber placebo light during functional magnetic resonance imaging (fMRI), with simultaneous assessment of pupil size as a proxy for norepinephrine release. Results suggest that acute exposure to blue light was potentially effective for sustaining neural efficiency. We found that a brief exposure to blue light in the scanner, during a time when melatonin levels were low, was associated with significantly suppressed deactivation of the default mode network, a brain system that is usually disengaged by difficult cognitive effort. This suggests that the brain exerted less effort during the task during blue light than amber, without alteration in performance. Melatonin levels and pupil size were unaffected by the light. However, we also found evidence that a brain region proximal to the location of the locus coeruleus (LC), a primary drive or norepinephrine release was also more activated by blue light than amber. We conclude that even brief exposures to blue light may provide an important and potentially effective method for sustaining cognitive performance.					
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1. INTRODUCTION:

The aim of this study is to understand the mechanism by which blue wavelength light leads to improvements of several aspects of cognitive functioning during the daytime (e.g., alertness, working memory performance, mood) that are independent of the well-established effects of blue wavelength light on circadian functioning. Previous studies have shown that blue light exposure may lead to increased activation within the locus coeruleus (LC). The LC is a small nucleus in the brainstem which, when activated, is responsible for the secretion of the neuromodulator norepinephrine which is then broadly distributed throughout the cortex. Increased levels of norepinephrine have been shown to be associated with a number of cognitive processes, including working memory performance as well as changes in mood. The aim of this study is to establish whether norepinephrine is in fact released as a function of blue light exposure, using combined functional magnetic imaging techniques as well as continuous measures of pupillary responses, which have been shown to be an index of norepinephrine release. This study will also establish how quickly these changes are apparent, and how they correlate with cognitive performance as well as functional brain activation changes on two different types of learning tasks.

2. KEYWORDS:

Blue wavelength light; functional magnetic resonance imaging; norepinephrine; melatonin; cognition; working memory; learning; locus coeruleus; alertness

3. ACCOMPLISHMENTS:

What were the major goals of the project?

According to the Statement of Work (SOW), the following major tasks were proposed with projected and actual completion dates:

Specific Aim 1: Identify the mechanism by which blue light exposure during the day leads to increases in alertness, cognitive performance, and mood in healthy individuals.	Projected Timeline	Actual completion date
Major Task 1: Study Preparation	Months	
Development of MRI compatible blue light device	1-4	Achieved: June 2019 (Y1)
Submit documents for IRB and HRPO approval	2-4	Submitted IRB: 07/01/2019 (Y1) Submitted HRPO: 08/16/2019 (Y1)
Place advertisements for participants recruitment	4-26	Started: 02/01/2020; Completed: 07/27/2021
<u>Milestone Achieved:</u> MRI compatible light devices created	4	Achieved: June 2019 (Y1)
<u>Milestone Achieved:</u> IRB and HRPO approval	4	Approval IRB: 08/15/2019 (Y1), IRB Renewal approved 7/24/2020 Approval HRPO: 01/30/2020 (Y1)
Major Task 2: Data Collection		
Collect data from participants	4-26	Started: 02/19/2020; Completed: 08/17/2021
<u>Milestone(s) Achieved:</u> Complete data collection	26	Achieved: 08/17/2021
Major Task 3: Process and Analyze Data		
Process fMRI, melatonin and pupillometry data	26-28	Completed: 12/22/2021

Analyze data and submit publications	28-30	Completed: 12/22/2021
<u>Milestone Achieved:</u> Study complete and final report submitted	30	Achieved: 12/22/21

What was accomplished under these goals?

Major activities:

3.A. Background and Study Overview

Background

It is known that targeted exposure to blue wavelength light at specific times of day can increase alertness and vigilance, and improve low mood during sleep-deprived as well as rested states, but can have disruptive effects at other times of day. However, the exact mechanisms underlying these advantageous effects of blue light are poorly understood. As a result, specific guidelines for the ideal use of blue wavelength light are non-existent, but greatly needed. The goal of the proposed project is to understand the mechanisms underlying the facilitating effects of exposure to blue wavelength light on alertness, vigilance, and mood. This project was designed to address how, and over what time scale, blue light exposure can help individuals who are sleep-deprived, experience excessive daytime sleepiness, and associated symptoms of low mood. Importantly, all of these symptoms negatively impact cognitive performance on and off the battlefield. The outcomes of this study will therefore be particularly important for developing guidelines on how to most effectively use blue light interventions in situations where quick increases in alertness and cognitive functioning are of crucial importance.

Blue Light and Melatonin Suppression. The discovery of melanopsin containing intrinsically photosensitive retinal ganglion cells (ipRGC) was the first step in understanding that light has significant effects on processes within the brain that are independent of vision. When light within the blue wavelengths (~460nm) hits the retina, these ipRGCs transmit signals to hypothalamic nuclei, in particular the suprachiasmatic nucleus (SCN), which is responsible for the entrainment of circadian rhythms. The SCN sends signals down the spinal cord where they are projected back up to the superior cervical ganglia, from which post-ganglionic neurons ascend back to the pineal gland, which in turn either initiates the release or the suppression of the production of the hormone melatonin. If melatonin production is initiated, usually in circadian rhythmicity with peak levels in the late evening, melatonin is circulated through the blood from the brain to all other areas of the body, which in turn prepares the body for sleep (see Figure 1 for an illustration of this mechanism)(Cajochen, 2007; Dijk & Archer, 2009).

It has been shown that exposure to blue wavelength light is used as a signal by the SCN to suppress melatonin production. If blue light is used in the morning, the circadian rhythm can be shifted, such as that the earlier melatonin production is suppressed in the morning, the earlier it is released in the evening, which is particularly useful in treating delayed sleep phase disorder (Cajochen, 2007). If blue light is used at night-time, *current* melatonin production is suppressed, which prevents sleep and increases alertness (Cajochen, 2007). Recently, this has been an increasingly common societal concern, where many individuals use devices that emit large amounts of blue light in the evening, such as computers, tablets, and phones. However, blue light exposure at night-time also has benefits, as it has been shown to be as effective

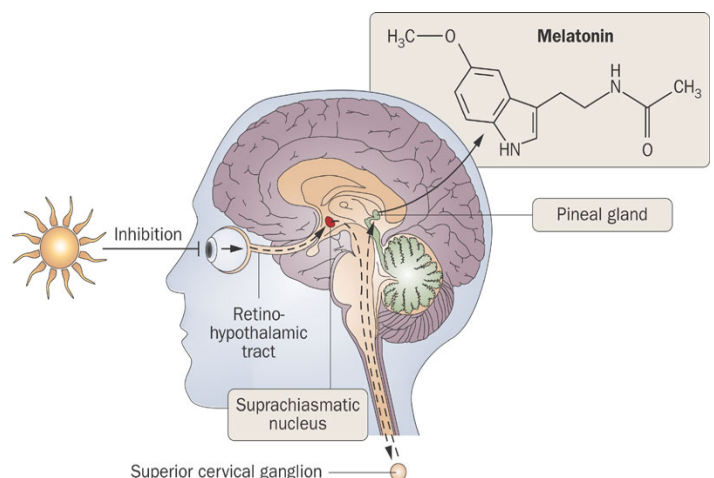


Figure 1 - This figure displays the mechanism by which exposure to blue light leads to suppression of melatonin.

as caffeine at maintaining alertness when it is necessary, for example when operating a motor vehicle for a long trip (Taillard et al., 2012).

A Proposed Second Mechanism. Suppression of melatonin production because of blue light exposure does not provide an explanation for all of blue light's beneficial effects. Blue light exposure also leads to increases in alertness during the daytime and associated functional brain activation changes during working memory tasks (Anna Alkozei, Ryan Smith, Derek A Pisner, et al., 2016) when melatonin levels are naturally so low that increased suppression is unlikely to provide any additional alerting effect. Thus, suppression of melatonin production cannot be the only mechanism. In addition, melatonin suppression does not explain why exposure to blue light also enhances mood in healthy individuals as well as populations with clinical depression. It also remains unclear how quickly blue light will lead to an alerting effect, and how long this effect will last. Some research has exposed individuals to light for long periods of time (i.e., several hours) before testing them on vigilance tasks, whereas others show an effect after just 30 minutes, but whether even shorter durations may be beneficial is unknown. In addition, there is some evidence that the effects of blue light last even after the light exposure has ended (Anna Alkozei, Ryan Smith, Derek A Pisner, et al., 2016), which suggests that one could use blue light in order to enhance alertness at a later timepoint. Ultimately, identifying and understanding all of the different mechanisms by which blue light operates will be important when developing concrete recommendations on when and how to best use blue light in various operational conditions.

We propose that blue light not only leads to a suppression of melatonin, but also sends direct neural signals to the locus coeruleus (LC), which when stimulated, releases norepinephrine throughout the cortex. Increased norepinephrine release leads to a variety of changes in brain function, including increases in alertness and focused attention (see Figure 2). It is known that the hypothalamus, where the SCN is located, has projections to the LC, and one study has shown that brief exposure of just 50-second bursts of blue wavelength light, in comparison to light within other wavelengths (violet and green light), led to increases in activation within an area in the brainstem proximal to the LC (Vandewalle et al., 2007). This suggests that within the first minute of exposure, the SCN may send signals to the LC, which plausibly leads to an immediate release of norepinephrine, leading to enhancements in cognitive function. This process would be significantly faster at increasing alertness than the well-established mechanism involving suppression of melatonin, where differences in melatonin levels during bright light (which contains predominantly blue wavelengths) versus dim light exposure occur on a timeframe closer to 30 minutes of exposure (Cajochen et al., 2005).

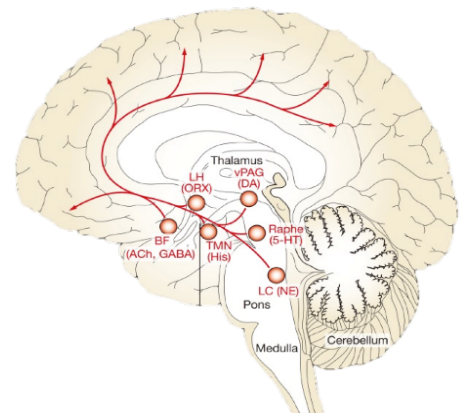


Figure 2 - This figure displays the connection of the hypothalamus to the LC and its connections

In addition, the LC has projections to other brain areas important for the processing of emotion, including the amygdala and hippocampus. It has been proposed that depression is characterized, among other things, by a disruption of norepinephrine neurotransmission (Delgado & Moreno, 2000), and a single dose of a selective noradrenergic reuptake inhibitor (a pharmacological treatment for depression) in healthy adults has been shown to lead to decreased neural responses to fearful versus happy faces within the amygdala and hippocampus (Rawlings et al., 2010). In addition, one study showed that blue light exposure increased activation in the anterior cingulate cortex, an area that often shows decreased activation in response to reward in individuals with depression, when anticipating a positive reward cue (Anna Alkozei, Ryan Smith, & William DS Killgore, 2016). This may explain the beneficial acute effects of blue light exposure on increases in positive mood in healthy individuals, as well as the beneficial effects of prolonged exposure to blue light over several weeks on decreasing symptoms of depression in clinical populations. Finally, suppression of melatonin is expected only to decrease sleepiness and increase alertness, but not to improve other aspects of cognition that are more complex, such as working memory performance; one study has shown, however, that blue light exposure led to subsequently better performance on a working memory task as well as associated functional brain activation changes, further supporting our hypothesis of enhanced norepinephrine release which affects cognitive processes in the prefrontal cortex (Anna Alkozei, Ryan Smith, Derek A Pisner, et al., 2016). However, as most studies did not measure activation within the LC during blue light exposure, all of these explanations remain speculative. In addition, no measure of changes in norepinephrine release as a result of blue light exposure was obtained in any of those studies. One way to noninvasively measure norepinephrine release in humans is by measuring changes in pupil dilation. Pupil diameter has been shown to covary with functional brain activation in the LC, both at rest and during performance of a cognitive task (Murphy et al., 2014). In order to establish whether these changes

in functional brain activation and subjective reports of alertness and mood occur after increased activation within the LC and resulting norepinephrine release, further research is greatly needed.

In addition, there appears to be a “dead zone,” approximately 6-8 hours after awakening during which blue light exposure does not have any effect on immediate melatonin levels and does not lead to a phase advance (or delay) of melatonin production. This appears to be the ideal time to study whether blue light will nevertheless have an effect on alertness, cognition, and mood, as it can be assumed that any observed effects are *not* due to melatonin suppression (see Figure 3).

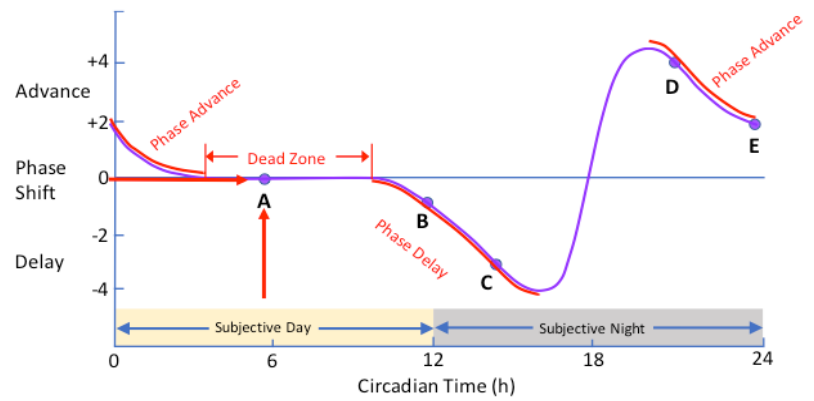


Figure 3 - Effects of timing of blue light exposure on melatonin release.

In summary, while some evidence suggests that exposure to blue light leads to a suppression of melatonin, which explains the associated decreases in sleepiness and increases in alertness, this mechanism only seems to explain one part of a bigger story. However, based on the previous limited literature, it seems plausible to assume that blue light exposure might have more immediate stimulating effects and affect processes other than simple alertness, such as mood and even more complex cognitive processes, such as working memory performance, due to enhanced norepinephrine release. For light therapy to become an operationally useful intervention that can be used to sustain attention during the daytime, it is critical that we identify whether its effects are due to the melatonin pathway that can only plausibly act at night-time, or whether there is also a faster, more immediate second pathway that activates norepinephrine.

Specific Aim

Specific Aim #1: Identify the mechanism by which blue light exposure during the day leads to increases in alertness, cognitive performance, and mood in healthy individuals.

The aim of this study is to identify a potential second, non-melatonin, system that explains why blue light exposure leads to increases in alertness, cognitive performance, and mood independent of, or interlinked with, melatonin suppression. In this study we will use continuous pupillometry combined with fMRI to identify (i) whether norepinephrine is, in fact, released in response to blue light exposure versus an amber placebo light of similar light intensity, (ii) how quickly norepinephrine is released in response to blue light (versus amber placebo light) exposure, (iii) how long these changes last, even after the light exposure has ended, (iv) how changes in norepinephrine can predict changes in subjective measures of alertness and objective measures of cognitive performance, beyond the effects of melatonin, and (v) whether individuals will report more positive mood after blue versus amber light exposure. We will measure the effects of blue light exposure during the “dead zone” (i.e., 6-8 hours after awakening) to prevent any confounding effect of melatonin suppression. However, we will measure salivary melatonin at frequent time points during and after blue light exposure to ensure that the changes in alertness and cognitive performance cannot be attributed to changes in melatonin levels.

Hypothesis

Based on the limited research described above, it is hypothesized that exposure to blue versus amber placebo wavelength light of similar irradiance, will lead to immediate increases in norepinephrine (as indexed by pupil dilation). Increases in norepinephrine will predict increases in subjective measures of alertness and mood, objective performance on a cognitive task, and associated changes in functional brain activation.

Methods

The objective of this project was to determine the neural mechanisms that contribute to the effects of blue light exposure during the day on alertness, cognitive performance, and mood. To accomplish this, we exposed healthy individuals to either **blue light** (active condition) or an **amber light** of similar brightness while undergoing various neuroimaging scans. Participants were exposed to both wavelengths (i.e., colors) on separate weeks in a counterbalanced cross-over design. Thus, each participant received both conditions and served as their own control.

As shown in Figure 4, this cross-over-controlled study included 40 healthy participants who completed a week of baseline actigraphic sleep measurement, and two counterbalanced assessment/neuroimaging sessions each separated by at least one additional week of actigraphic assessment. Each assessment/neuroimaging session was essentially identical, except that participants were exposed to a different color of light (i.e., either blue or amber) while undergoing neuroimaging. They received the alternate color of light during their next neuroimaging session.

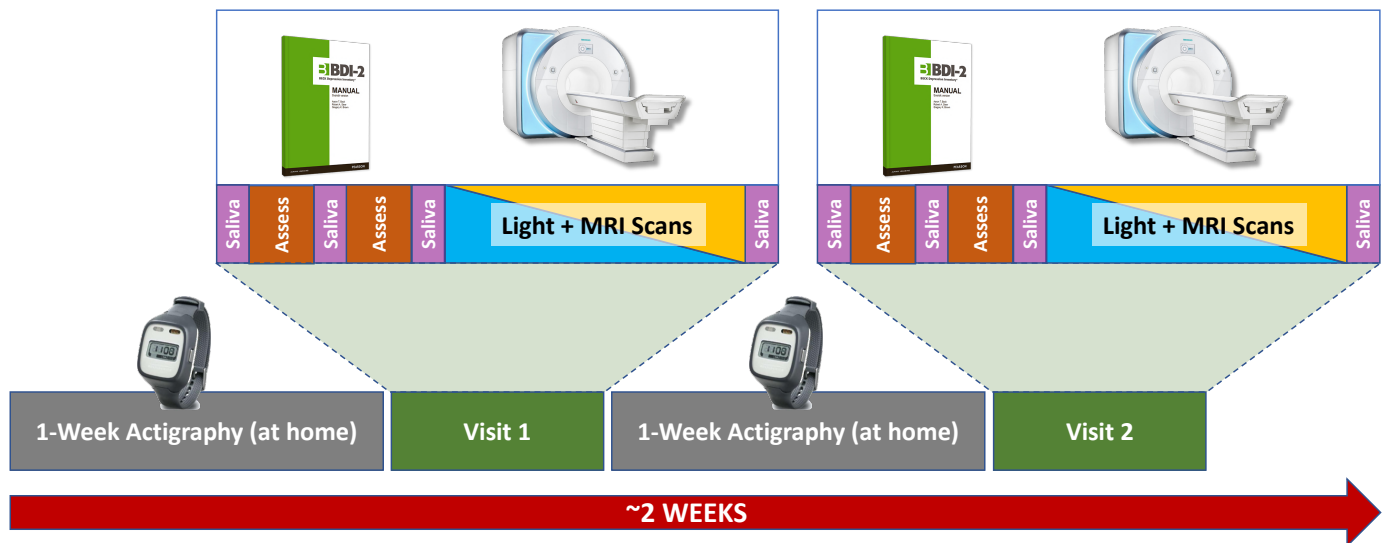


Figure 4. Study Design: Participants were sent an actigraphic sleep watch to wear for one week prior to coming to the lab. The actigraph measured sleep during the week. Then, the participant attended Visit 1, which involved an initial saliva sample, a 1- hour series of behavioral assessments and self-report inventories, two additional saliva samples, and a 1-hour neuroimaging scan. During the scan participants were either exposed to blue light or amber light during various functional magnetic resonance imaging scans. The same light color was used throughout the entire Visit 1 session for all scans. Upon leaving the scanner, participants provided a fourth saliva sample for melatonin analysis.

The various components of the procedures and activities are described in greater detail below:

Screening Week.

The week before the first visit was considered a screening week in which participants were asked to maintain their consistent and regular sleep routine to ensure they would be eligible for the main part of the study. Participants were mailed a Philips Respironics Actiwatch 2 or Actiwatch Spectrum device at least 4 business days prior to the start of the screening week. This was done to ensure that each actigraphy week occurred for a full 7 days prior to the scanning visit. Participants were also sent a link to a sleep diary to complete on REDCap each morning. Those who did not fill out their sleep diaries before 4:00 p.m. each day were contacted by phone and reminded to complete it before the end of the day. Sleep diary responses were also reviewed each day and if a participant was not following the appropriate sleep schedule, they were warned that they may no longer be eligible to participate if the non-compliance continued. This was done to ensure participant adherence to the sleep-wake patterns of the study and to minimize error due to circadian fluctuations. Participants were also mailed a pair of blue light blocking glasses, which they were asked to wear on the morning of the visits to the lab.

Visit 1

After a week of actigraphically monitored at-home normal sleeping, participants wore their assigned blue-blocking glasses and traveled to their appointment at the University of Arizona Bioscience Research Laboratories (BSRL) where the 3T MRI scanner is located. All assessment and neuroimaging activities took place in the BSRL. All participants arrived and completed scanning between 10:30 a.m. and 2:00 p.m. This was done to ensure that the effects of light exposure were assessed during the theoretical “dead-zone” when light has been suggested to have minimal effects on melatonin.

Pre-Neuroimaging Activities: Participants arrived at the BSRL at 10:30 a.m. wearing their blue-blocking glasses and wore the glasses at all times when not inside the MRI scanner. Upon arrival, participants were escorted to a quiet testing room. The overhead lights within the testing room were turned off and the only source of light was a single lamp that was turned on in the back corner of the room. The lux level of the room was monitored at each session and maintained at 15 to 45 lux at all times. This was done to minimize the effects of extraneous light exposure on melatonin or brain activation. Furthermore, the display settings of the computer laptop that was used for data collection was set to “night mode” which is reported to present minimal to no blue light from the screen. The brightness level of the screen was also reduced to a low setting of 15. Prior to the neuroimaging scans, participants completed a variety of tasks, including an MRI safety checklist, pregnancy test (females), behavioral assessments, saliva samples and practice tasks for the MRI scan.

Due to the COVID-19 pandemic, we enacted a strict protocol to ensure that participants and staff maintained safe distances at all times. To facilitate this, the data collection was conducted via a remote video chat option (i.e., Zoom), which allowed the participant to interact with the research technician who was in a nearby room. Upon arrival at the testing room, the participant was asked to be seated and get comfortable. They completed preliminary questionnaires and safety forms. At 11:00 a.m. participants completed the first saliva collection. They were asked to passively drool into a saliva collection cup, which was then processed by Salimetrics for melatonin levels. Participants continued with questionnaires and completed a second saliva sample at 11:30 a.m. Table 1 presents a list of the behavioral tasks completed prior to entry into the MRI scanner. Just prior to entry into the scanner, participants were given a brief practice session for each of the cognitive tasks that would occur during the MRI scan. The practices session for the N-back task was just slightly different than the one in the scanner, in that it provided feedback to the participant to allow them to learn how the task worked. If the average performance was below 50% correct for any trial, the instructions and practice task was repeated. After the practice tasks, participants provided a third saliva sample at 12:00 p.m. and then entered the scanner.

TABLE 1. MEASURES ADMINISTERED

Karolinska Sleepiness Scale (KSS)	Single item measure of current sleepiness
Beck Depression Inventory-II (BDI-II)	Measure of depressive mood state
State-Trait Anxiety Inventory-State (STAI-S)	Assesses the construct of current “state” anxiety on the day of testing
State-Trait Anxiety Inventory-Trait (STAI-T)	Assesses the construct of general “trait” anxiety generally
Gratitude Resentment and Appreciation Test (GRAT-R)	Assesses an individual’s dispositional gratitude
Pittsburgh Sleep Quality Index (PSQI)	Assesses the frequency and severity of sleep disturbances
Beck Anxiety Inventory (BAI)	Measure of current state of anxiety
Positive and Negative Affect Schedule (PANAS)	Measure of two orthogonal mood constructs of positive affect and negative affect
Sleep Quality Scale (SQS)	Measures six domains of sleep quality, including daytime symptoms, restoration after sleep, problems initiating and maintaining sleep, difficulty waking, and sleep satisfaction
Social Support Questionnaire (SSQ)	Assesses perceptions of social support and satisfaction with that support

Neuroimaging: At 12:00 p.m. participants were escorted to the 3T MRI scanner, fitted with earplugs, laid supine in a comfortable position on the scanner table and moved into position. The main lighting system was disengaged from the scanning room to ensure that participants were not receiving extraneous light sources during scanning. During the various scanning procedures, participants were exposed to either an amber ($\lambda = 580 \text{ nm}$, $14 \mu\text{W} \cdot \text{cm}^{-2}$ at cornea) or a blue ($\lambda = 470 \text{ nm}$, $13 \mu\text{W} \cdot \text{cm}^{-2}$ at cornea) light for a **total of 39 minutes and 38 seconds** (using a fiber-optic cable directed through a lens positioned just above the participant’s right eye) during the one hour scanning session. Light wavelength (blue or amber) was always consistent throughout the scanning day but was counterbalanced across sessions for each participant in a cross-over design. Our lab constructed a unique fiber-optic light presentation system to directly provide light stimulation into the head coil of the scanner, which cannot be done with standard electronic light devices. The system uses a bright (31,000 lux at light source) cold white LED light source (Edmund Optics SugarCUBE Model # 38000-M03-005) placed

outside of the Faraday cage (Figure 5A). Light intensity was computer controlled. A 9.1 meter 25mm diameter non-metallic optical fiber (Dolan-Jenner Industries Dwg # 70-001424) (Figure 5B) runs from the light source/filter wheel that can switch between blue wavelength light and amber wavelength light (Figure 5C) to the head coil mounting assembly (Figure 19D) (BDPS 3D printed design). This assembly will be mounted to the head-coil that is part of the MRI scanner (Figure 19E). Monochromatic light is produced with narrow band filters (Edmund Optics stock #65-144 470nm; stock #65-161 580nm) mounted in a multi-position computer-controlled filter wheel (Spectral Products AB-301T) that is attached to the LED light source. Figure 5F shows a participant in the scanner and the location of the LED stimulator presented to the participant's right eye.

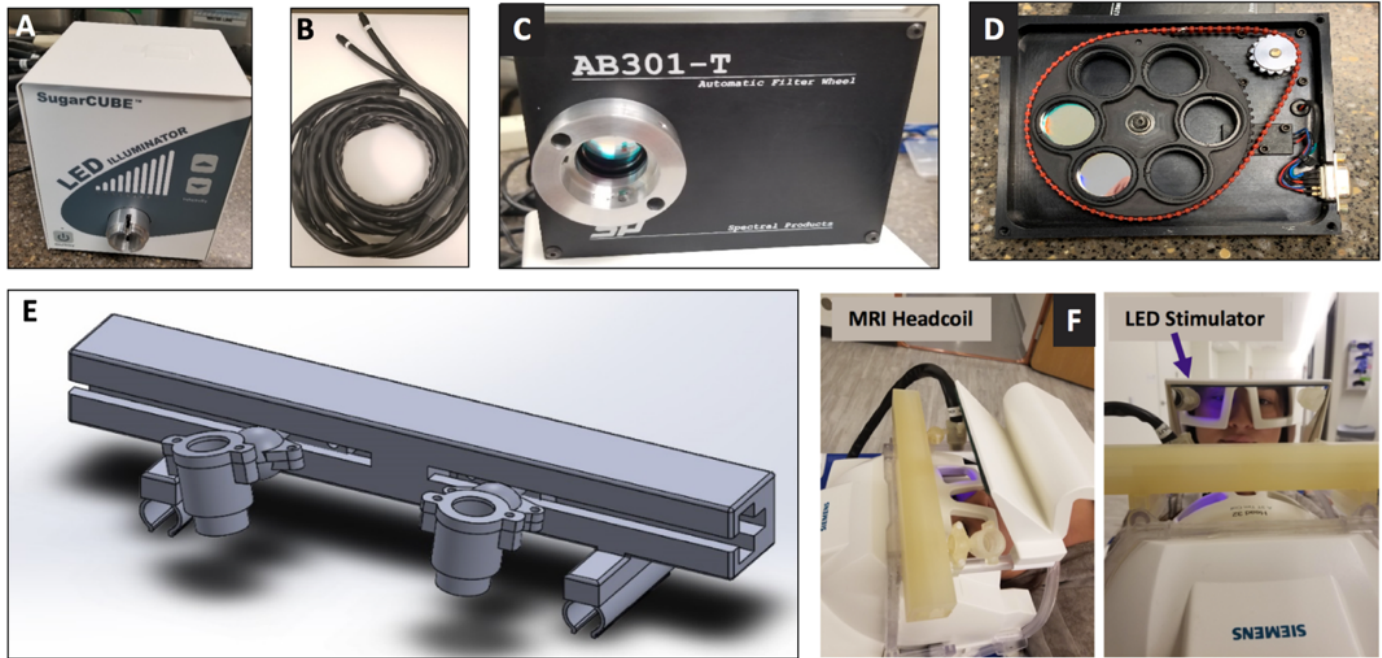


Figure 5. Our lab has constructed a unique fiber-optic LED stimulation system that allows direct unilateral or bilateral stimulation with various wavelengths during MRI scanning. This light stimulation system is built into the MRI head-coil and is designed to allow free viewing of projected stimuli and direct monitoring of pupillary response, eye-blink rate, and eye-tracking during functional MRI scanning.

The fiber optic light system presented either amber or blue wavelength light while the participant was being scanned by the MRI system. Table 2 below presents the output parameters for the system. The light presentation system underwent an in-person optical radiation hazard analysis by David H. Sliney, Ph.D., who is an expert in determining the safety of light devices. Dr. Sliney determined that the light presentation system used here was “safe” for its intended uses and posed no optical radiation hazard to participants.

Source	Source Type	Center Wavelength (nm)	Band-width (nm)	Corneal Plane		Retina	
				Size	Irradiance [#] Radiance	Size	Irradiance [†]
Blue	Filtered “white” LED	~470 nm	10	13.7 mm diameter	13 $\mu\text{W}\cdot\text{cm}^{-2}$ 0.22 $\text{mW}\cdot\text{cm}^{-2}\cdot\text{sr}^{-1}$	> 4.7 mm spot	4.8 $\mu\text{W}\cdot\text{cm}^{-2}$
Yellow (amber)	Filtered “white” LED	~580 nm	10*	13.7 mm diameter	$\leq 14 \mu\text{W}\cdot\text{cm}^{-2}$ * 0.23 $\text{mW}\cdot\text{cm}^{-2}\cdot\text{sr}^{-1}$	> 4.7 mm spot	4.8 $\mu\text{W}\cdot\text{cm}^{-2}$
Video screen	LED $L_v < 0.1 \text{ cd}\cdot\text{cm}^{-2}$	Full color palette	---	> 10° field- of- view	< 10 $\mu\text{W}\cdot\text{cm}^{-2}$ < 0.5 $\text{mW}\cdot\text{cm}^{-2}\cdot\text{sr}^{-1}$	> 3 mm spot	< 8 $\mu\text{W}\cdot\text{cm}^{-2}$

Table 2. *The spectral transmission of the filter was clearly outside of the Edmund Optics specification for a 10-nm full-width-half-maximum (FWHM) bandwidth of 10 nm, and the filter will be replaced, and radiant power checked.

[#]The initial corneal irradiance of 13 $\mu\text{W}\cdot\text{cm}^{-2}$ was chosen based on some earlier studies.

[†]A 3-mm pupil is assumed.

Participants first completed a resting state and N-back task in the scanner without light manipulation (i.e., in the ambient low light conditions of the MRI scanner). For the N-back task, a widely used cognitive task that draws heavily upon working memory (task duration = 10 minutes and 38 seconds). Conditions included 0-back (i.e., response time to press the key whenever a specific number occurred), 1-back (i.e., response to an item identical to the preceding item), 2-back (i.e., responding to a number that was repeated to items before), and 3-back (i.e., responding to a number that was repeated 3 items earlier). Then, participants were exposed to either amber or blue light in a 30 second epochs (i.e., 30 seconds on, 30 seconds off) for 12 minutes during a resting state scan. After the resting state scan, the fiber optic light was activated and remained constantly illuminated throughout the duration of each task. The participant completed the N-Back task again, this time with the light constantly illuminated through the fiber optic cable. Throughout the scan, functional brain changes and pupil dilation was tracked. Data were collected using a Skyra 3T MRI scanner using a 32-channel head coil. During the structural scan, images were collected using a T1-weighted MPRAGE sequence (TR / TE / flip angle = 2.1 s / 2.33 ms / 12 degrees) over 176 sagittal slices (256 × 256) and a slice thickness of 1.00 mm (voxel size = 1 × 1 × 1). For functional imaging during the n-back task, T2*-weighted functional MRI scans were collected over 32 transverse slices and a slice thickness of 2.5 mm using an interleaved sequence (TR / TE / flip angle = 2.0 s / 25.0 ms / 90 degree) with 319 images collected per slice. Data were collected with a 22.0 cm field of view and a 64 × 64 acquisition matrix.

Post-Neuroimaging: At 1:00 p.m., participants exited the 3T MRI scanner and completed close out-forms and necessary rest activities. At 1:30 p.m., the participants completed the fourth and final saliva sample for the day. Participants were released from the lab wearing their actigraph watch and scheduled to return for the second scanning session after 7 days. All saliva samples were immediately transported to the UA CATS Center and placed in a -37°C freezer. Saliva samples from multiple subjects were then transported to Salimetrics for processing and analysis according to standard procedures.

Interim Week

Participants were asked to continue to maintain their consistent and regular sleep routine while wearing their assigned wrist actigraph. This was done to ensure that each actigraphy week occurred for a full 7 days prior to the second scanning visit. Participants continued to complete their sleep diary on REDCap each morning. As before, those who did not fill out their sleep diaries before 4:00 p.m. each day were contacted by phone and reminded to complete it before the end of the day. Participants were reminded to return to the lab for Visit 2 a week later.

Visit 2

After at least 7 days, each participant returned to the UA Bioscience Research Laboratories (BSRL) wearing their blue light blocking glasses. Participants were met by a research technician who escorted them to the 3T MRI scanner unit. As described in detail for Visit 1, participants arrived and completed scanning between 10:30 a.m. and 2:00 p.m. All activities during Visit 2 were completely identical to Visit one, except that the participants were exposed to the alternate color light (i.e., wavelength stimulation) relative to the previous week (i.e., if amber on Visit 1, then blue on Visit 2; if blue on Visit 1, then amber on Visit 2). Upon completion of all task activities, participants returned the wrist actigraph and the blue-light blocking glasses and completed their payment forms and were released from the study.

3.B Sample Characteristics

Data collection for the project is complete. A total of $N = 45$ participants enrolled in the study and were randomly assigned to one of the two light administration orders. Of those enrolled, 9 failed to complete the study, resulting in a final sample of $N = 36$ who completed both conditions. Below are the Inclusion and Exclusion Criteria:

Inclusion/Exclusion Criteria:

Participants met the following criteria:

- Age between 18-40 years old
- Have a regular sleep schedule (going to bed between 9 p.m. and 12 a.m. and waking between 6 a.m. and 8 a.m.) (As confirmed by one week of actigraphy data)
- Sleep for 7-9 hours each night and the night before the assessments (as confirmed by actigraphy)
- Are free from any serious medical or psychological disorders, including substance use disorders and bipolar disorder.

- Meet MRI safety standards (e.g., no metal in body)
- No use of psychotropic medication that could confound brain imaging results
- No use of photosynthesizing medication
- Never had cataract surgery
- Normal or corrected vision (must wear contacts as glasses would impair pupillometry)
- Primary English speaking as indexed by speaking English most in the home
- Obtained at least 9 years of education

Participant Selection Procedures:

Advertisements were placed within the local Tucson and surrounding metropolitan areas. Advertisement occurred through posted flyers and various internet ad campaigns. Interested participants contacted the investigators by registering on our laboratory webpage and were then contacted by a trained research assistant by phone. During the phone call, participants were given a full description of the study, had the opportunity to ask questions. After completing the online informed consent procedure, eligible participants were sent a box containing the actigraphic watch, blue light blocking glasses, and instructions for use and instructions for logging onto the REDCap data collection portal for completing their daily sleep diaries.

Baseline Demographics:

Basic demographic characteristics for the entire sample, $N = 45$ (regardless of whether they completed all conditions) is reported in Table 3. There were 17 males (37.8%) and 28 females (62.2%). The ratio of males to females did not differ significantly ($\chi^2 = 2.22, p = 0.13$).

Table 3. Baseline Demographic characteristics

	M	SD
Age	24.22	5.98
Education (years)	14.88	1.83
Height (inches)	67.98	4.38
Weight (pounds)	159.93	38.72
Male/Female (n)	17/28	--

In addition to demographic information, all participants completed psychological questionnaires to assess depression, anxiety, sleep problems, and other characteristics. Summary statistics for baseline psychological characteristics are presented in Table 4.

Table 4. Baseline Psychological characteristics

	M	SD
Karolinska Sleepiness Scale (KSS)	3.22	1.33
Beck Depression Inventory-II (BDI-II)	5.44	5.10
Beck Anxiety Inventory (BAI)	5.77	4.86
State-Trait Anxiety Inventory—State (STAI-S)	30.33	8.07
State-Trait Anxiety Inventory—Trait (STAI-T)	34.82	9.37
GRAT-R	323.82	34.42
Positive and Negative Affect Schedule-Positive	27.22	7.87
Positive and Negative Affect Schedule-Negative	11.78	3.36
Sleep Quality Scale (SQS)	24.13	9.01
Social Support Questionnaire	40.69	5.33

3.B. Melatonin Sampling

Prior research has reliably shown that exposure to blue-wavelength light in the morning or evening hours suppresses melatonin production and is associated with a phase shift in the onset of subsequent melatonin (Panda et al., 2005; Provencio et al., 2000; Qiu et al., 2005; Sapede & Cau, 2013). Specifically, blue light in the morning has been shown to suppress immediate melatonin levels and phase advance the onset of the next cycle of melatonin production (i.e., melatonin production will occur earlier the next night), while blue light in the evening is associated with a phase delay of melatonin onset (i.e., melatonin production will occur later in the night/early morning) (Geerdink et al., 2016). A key goal of the present study was to determine whether blue light could lead to an alerting effect during the “dead zone” during the middle of the day, when melatonin levels are low and there should be no discernable effect of acute light exposure on melatonin or subsequent phase shifts (Pohl, 1982). Thus, brain effects would be assumed to be due to activation of other systems, exclusive of the melatonin system. Nonetheless, it was crucial to measure melatonin levels before and after the neuroimaging session to evaluate their potential impact.

As shown in Figure 6, melatonin was sampled using a passive drool collection of saliva at four time points at each session. Participants provided a saliva sample at 11:00 a.m., 11:30 a.m., 12:00 p.m., and again after the scan at 1:30 p.m. Thus, each participant provided eight samples in total (4 from each session). Samples were transported and stored immediately in a -37°C freezer at the University of Arizona until they were prepared and shipped to Salimetrics for analysis. Samples were assayed at the Salimetrics SalivaLab (Carlsbad, CA) using the Salimetrics Salivary Melatonin Assay Kit (Cat. No. 1-3402), without modifications to the manufacturers’ protocol. Samples were thawed to room temperature, vortexed, and then centrifuged for 15 minutes at approximately 3,000 RPM (1,500 x g) immediately before performing the assay. Samples were tested for salivary melatonin using a high sensitivity enzyme immunoassay (Cat. No. 1-3402). Sample test volume was 100 µl of saliva per determination. The assay has a lower limit of sensitivity of 0.58 pg/mL, a standard curve range from 0.78-50 pg/mL, and an average intra-assay coefficient of variation of 5.42%, and an average inter-assay coefficient of variation 8.90%, which meets the manufacturers’ criteria for accuracy and repeatability in Salivary Bioscience, and exceeds the applicable NIH guidelines for Enhancing Reproducibility through Rigor and Transparency.

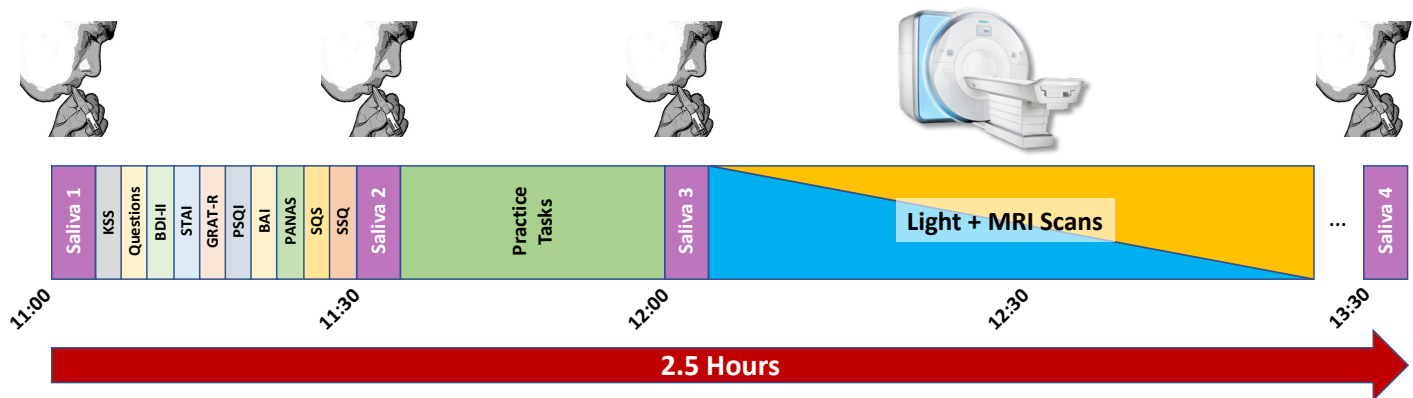


Figure 6. Overview of each in-lab study session. At 11:00 a.m., participants provided Saliva Sample 1. For the next half hour, participant completed a series of questionnaires and assessment tasks. Saliva Sample 2 was provided at 11:30 a.m., and was followed by a half hour of practice tasks to ensure the participant was ready to engage in the MRI study. At 12:00 p.m., the participant provided Saliva Sample 3. Immediately afterward, the participant was escorted to the MRI scanner and completed several scans while exposed to either blue or amber light. Upon exiting the scanner and dressing, the participant then provided Saliva Sample 4 at 1:30 p.m.

Melatonin from each of the Saliva Samples (1-4) and for each Week (Week 1 or Week 2) was compared between each light administration order (*Order A* = Amber week 1, Blue week 2; *Order B* = Blue week 1, Amber week 2) using a 2 (Order) x 4 (Saliva Sample) x 2 (Week) within subject analysis of variance (ANOVA), applying Greenhouse-Geisser corrections when sphericity was violated. As shown in Figure 7, there was **no effect** of treatment Order, $F_{(1,23)} = 0.87, p = .361$, or Week, $F_{(1,23)} = 0.43, p = .52$. However, there was a **significant main effect of Saliva Sample**, $F_{(1,32,35.85)} = 9.58, p = .002$, suggesting that across both weeks, melatonin generally declined across the session from 11:00 a.m. to 1:30 p.m. There were no interactions between Saliva Sample and Order, $F_{(1,32,35.85)} = 1.02, p = .344$, or between Saliva Sample and Week, $F_{(1,56,35.85)} = 1.23, p = .295$. finally, there was no significant 3-way interaction among Week x Saliva Sample x Order, $F_{(1,56,35.85)} = 2.36, p = .120$.

To explore further, we conducted a simple comparison between the salivary melatonin means for the blue and amber conditions from sample #4 (post-light administration). Across both weeks and orders, the mean melatonin level post light exposure was: Blue = 7.22 pg/mL (SD = 7.25) and Amber = 7.80 pg/mL (SD = 12.72), which was not significantly different between light conditions, $t(28) = -0.499, p = .622$.

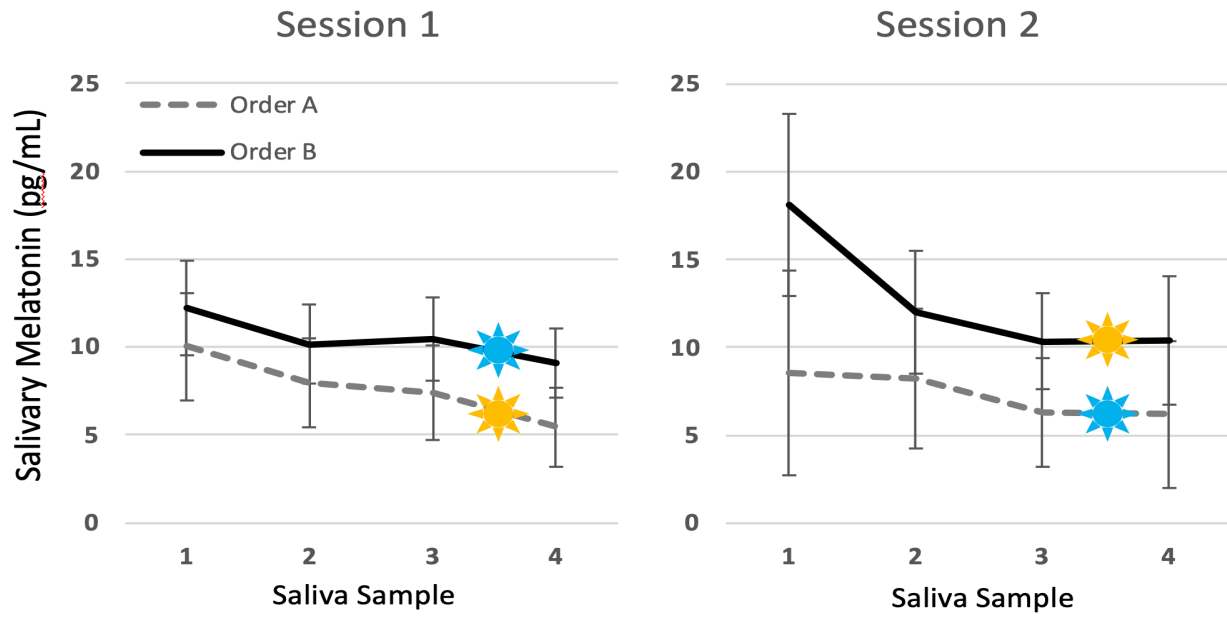


Figure 7. Melatonin outcomes. A repeated measures analysis of variance (ANOVA) compared the two light conditions (blue vs amber) across four saliva samples (1-3 prior to light, 4 after light), across two sessions. Overall, the outcomes suggest that melatonin levels generally declined early in the session but did not differ post-light treatment. This is consistent with our expectations that melatonin levels are quite low during the middle portion of the day and are unlikely to have significant effects on performance or be modulated significantly by light at this time of day. In other words, as expected, the study took place in the “dead zone” in the middle of the subjective day.

Together, these findings support our expectation that the middle part of the day reflects the hypothetical “dead zone” for phase shifting of melatonin (Pohl, 1982). While this “dead zone” in responsiveness to light has been argued to not exist in humans (Jewett et al., 1997), we find evidence here that melatonin was not affected significantly by the level of light during the scans, regardless of wavelength. Overall, we find that melatonin levels were quite low on average for our sample, declined slightly in the late morning, and were essentially unaffected by blue or amber light during the scanning session between 12:00 p.m. and 1:30 p.m. ***Therefore, because melatonin was not changed as a result of light exposure during this time, we can assume that any light-related changes we find in neuroimaging are NOT driven by melatonin shifts.***

3.C. Neuroimaging Data

Multimodal neuroimaging data were collected from each participant at two time points to assess the independent effects of a single session exposure of either blue or amber light on brain function and connectivity. Each session was separated by at least seven days to ensure full washout of all light-related effects.

Data Collection: Neuroimaging data were collected using a 3T Siemens MAGNETOM Skyra using a 32-channel head coil. Head movement was restricted using foam cushions during all image acquisition. We collected a high-resolution anatomical T1-weighted (T1w) MPAGE (TR/TE/flip angle = 2150 msec., 2.71 msec., 12°) that consisted of 256 slices (256 x 256 matrix) with a slice thickness of 0.7mm and voxel size of 0.7mm x 0.7mm x 0.7mm. Functional images were acquired using a gradient echo T2*-weighted sequence, 2.0mm x 2.0mm x 2.0mm with 10% distance factor (TR/TE/flip angle = 2000 msec., 36 msec., 90°). Resting-state functional images were collected with 60 transverse slices and a voxel size of 2.0mm x 2.0mm x 2.0mm with 10% distance factor (TR/TE/flip angle = 2000 msec., 36 msec., 90°), in an interleaved excitation order, with anterior-posterior phase encoding. During the collection of the resting state functional data, participants were instructed to remain awake but keep their eyes closed and let their “mind wander”.

Image Processing: Neuroimaging data were processed using standard preprocessing pipelines. Functional MRI data were pre-processed using SPM12. Functional connectivity data were analyzed using the Functional Connectivity Toolbox (CONN). Specific imaging parameters are presented below.

C.I. Task Based Functional MRI (fMRI)

N-Back Task. Participants completed a working memory task while in the scanner and exposed to either the blue-wavelength or amber-wavelength light throughout the duration of the task (on alternate weeks). The N-Back task is widely used in functional neuroimaging for probing working memory (Drobyshevsky et al., 2006; Jansma et al., 2000). During the N-Back task, participants continuously monitored a series of letters as they appeared on a screen and were required to indicate when a pre-specified target letter appeared in the sequence (see Figure 8). During the control portion of the task (0-back), the subject merely responded when the pre-specified letter appeared on the screen (e.g., the letter “X”). The control task was simple and required only that the participant maintained simple attention to respond to the stimulus when it appeared. Working memory load for the task was increased in other conditions by requiring the individual compare the current stimulus to a previously seen stimulus that may have occurred earlier in the sequence. This could range from 1-back, which simply required the individual to respond affirmatively if the current stimulus matched the stimulus seen in the preceding trial (i.e., “1 trial back”). Greater working memory load occurred with the 2-back condition, where the participant had to compare the current stimulus to the stimulus seen two trials earlier. Finally, the greatest working memory load occurred during the 3-back condition, where the participant was required to compare the current stimulus to the stimulus seen three trials earlier in the series. Greater working memory load, such as occurs during the N-Back task has been shown to reliably activate the dorsolateral prefrontal cortex (Drobyshevsky et al., 2006) and is associated with reduced activation in the default mode network (DMN) (Anticevic et al., 2012). We have used this N-Back task in prior work and have shown that it is sensitive to blue-light exposure (Alkozei et al., 2016).

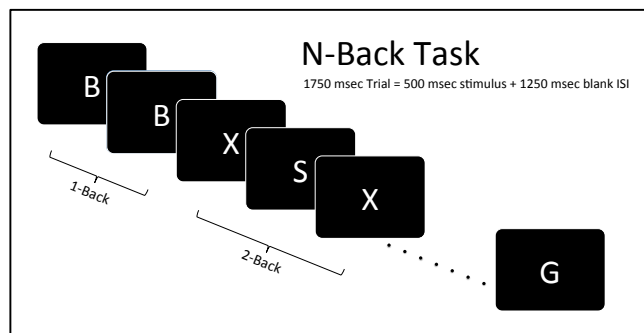


Figure 8. N-Back Task. Participants view a series of letters that appear on the screen for 500 ms, with a 1250 ms intertrial waiting period. This is a working memory task where the participant must press a key each time the letter on the current screen matches a letter seen on a previous screen, either 1-back, 2-back, or 3-back. Working memory load is increased with greater number of steps backward in the sequence that must be remembered. The control task requires the individual to respond every time they see a specific stimulus (e.g., “X”), which is essentially a simple vigilance/attention task.

In the present study, participants were exposed to either blue or amber light in their right eye throughout the duration of the N-Back task. Functional MRI data were analyzed using Statistical Parametric Mapping (SPM12). To evaluate the effects of light on brain activation, we first constructed simple contrasts between the relevant conditions (Fixation, 0-back, 1-back, 2-back, and 3-back) for each administration. Each contrast (e.g., 1-back > 0-back) was first compared *within* each light administration condition using a 1-sample t-test. Then, each contrast (i.e., the beta image comprising changes in activation associated with the task parameters) was compared between the blue and amber conditions using a paired-samples t-test (i.e., second level random effects analysis).

Additionally, due to a technical error, some scans were collected with a reduced number of brain slices that did not provide full coverage of the brainstem at the level of the Locus Coeruleus (LC). Once this was discovered during Quality Assurance checks, we made the decision to collect additional scans that provided full coverage of the entire brain and brain stem. Therefore, we have conducted two separate sets of analyses, including the large Full Data Set ($n = 26$) that has a larger sample size but reduced whole-brain coverage and a reduced set ($n = 23$) that provides full coverage of the brain including the LC (LC Set) in a smaller sample. Both of these analysis sets were undertaken and will be described in detail below:

Full Data Set

The Full Data Set comprises all participants with usable data in both the amber and blue conditions ($n = 26$), but due to technical issues, does not include the LC.

1-Back vs. 0-Back Trials

The 1-Back > 0-Back condition was the simplest task to complete. Essentially, the participant simply had to note that at two stimuli occurred in a row.

One-Sample T-Tests. First, we compared the mean contrast maps for the 1-back > 0-back trials for each light condition separately. This contrast represents the lowest level of working memory load, as it only requires simple comparison between the current stimulus and the preceding stimulus. Figure 9 shows the uncorrected activation patterns at

$p < .001$ (uncorrected height) with $p < .05$ FDR cluster correction for the blue and amber conditions separately, which allows simple inspection of the data.

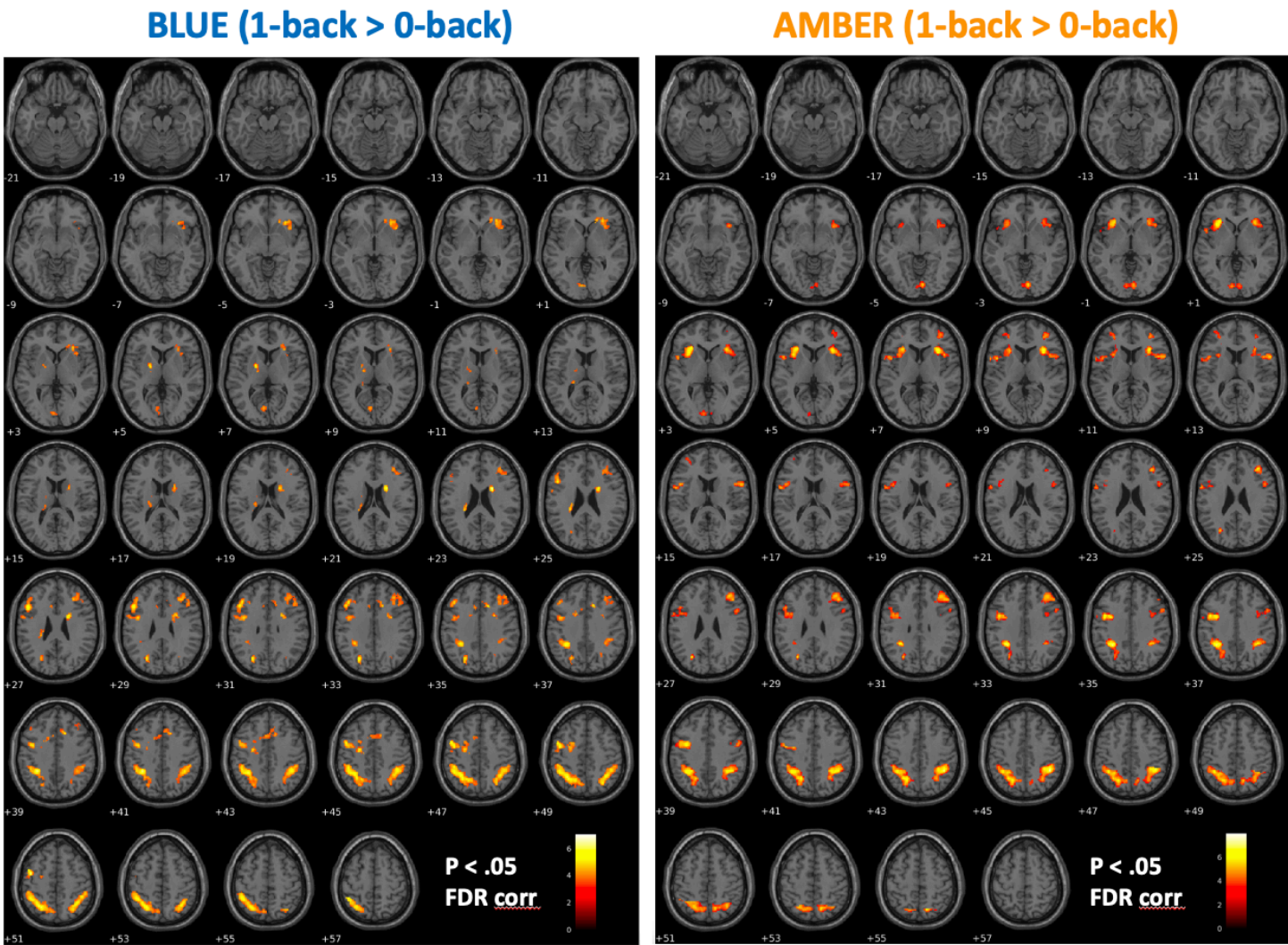


Figure 9. Multi-slice montage of the one-sample t-test outcomes of the 1-back > 0-back task. This contrast shows the brain regions that were more active during the more demanding condition of the task for each of the two light conditions separately. The data are corrected for multiple comparisons with height $p < .05$ and cluster-wise correction at FDR $p < .05$.

As evident in Figure 9, this simple and non-demanding portion of the task led to very similar activation patterns of task positive activation within each group overall, with activation evident in fronto-parietal attention networks regardless of light wavelength. The statistics for each of these analyses are presented in Table 5.

BLUE (1-back > 0-back)

Statistics: *p*-values adjusted for search volume

set-level		cluster-level				peak-level					mm mm mm		
<i>p</i>	<i>c</i>	<i>p</i> _{FWE-corr}	<i>q</i> _{FDR-corr}	<i>k</i> _E	<i>p</i> _{uncorr}	<i>p</i> _{FWE-corr}	<i>q</i> _{FDR-corr}	<i>T</i>	(<i>Z</i> _z)	<i>p</i> _{uncorr}			
0.000	12	0.001	0.000	205	0.000	0.014	0.162	7.02	5.17	0.000	20	4	24
						0.755	0.364	4.74	3.96	0.000	24	6	36
		0.000	0.000	417	0.000	0.034	0.162	6.57	4.96	0.000	-44	-2	32
						0.427	0.269	5.20	4.24	0.000	-40	-2	40
						0.572	0.294	4.99	4.12	0.000	-42	-2	30
		0.000	0.000	1693	0.000	0.053	0.162	6.34	4.85	0.000	-32	-44	40
						0.072	0.162	6.18	4.77	0.000	-26	-60	52
						0.079	0.162	6.13	4.75	0.000	-32	-54	50
		0.000	0.000	275	0.000	0.145	0.164	5.82	4.58	0.000	14	20	40
						0.650	0.326	4.88	4.05	0.000	-16	8	38
						0.933	0.461	4.41	3.75	0.000	-10	14	48
		0.000	0.000	303	0.000	0.149	0.164	5.81	4.58	0.000	-48	20	28
						0.462	0.269	5.15	4.21	0.000	-44	28	34
						0.999	0.670	3.88	3.40	0.000	-32	26	32
		0.000	0.000	871	0.000	0.150	0.164	5.80	4.58	0.000	34	-54	52
						0.263	0.217	5.49	4.41	0.000	40	-44	44
						0.455	0.269	5.16	4.22	0.000	46	-36	42
	0.109	0.040	72	0.007		0.202	0.183	5.64	4.49	0.000	-22	-2	6
						0.722	0.352	4.79	3.99	0.000	-18	-10	10
						1.000	0.904	3.54	3.15	0.001	-22	-8	22
	0.005	0.002	152	0.000		0.366	0.263	5.30	4.30	0.000	-24	-8	46
						0.905	0.461	4.48	3.80	0.000	-20	2	50
						0.973	0.511	4.25	3.65	0.000	-18	-14	46
	0.000	0.000	345	0.000		0.540	0.285	5.03	4.14	0.000	28	28	2
						0.764	0.364	4.72	3.96	0.000	18	32	2
						0.882	0.461	4.53	3.83	0.000	36	16	-2
	0.034	0.014	100	0.002		0.553	0.287	5.02	4.13	0.000	-26	-30	26
						0.935	0.461	4.40	3.75	0.000	-22	-30	14
						0.976	0.516	4.24	3.64	0.000	-22	-20	20
	0.000	0.000	417	0.000		0.721	0.352	4.79	3.99	0.000	30	32	28
						0.928	0.461	4.42	3.76	0.000	34	36	34
						0.938	0.461	4.39	3.75	0.000	44	24	32
	0.066	0.025	84	0.004		0.906	0.461	4.47	3.80	0.000	-8	-82	2
						0.957	0.461	4.33	3.70	0.000	-6	-74	8

table shows 3 local maxima more than 8.0mm apart

Height threshold: $T = 3.45$, $p = 0.001$ (1.000) Degrees of freedom = [1.0, 25.0]
 Extent threshold: $k = 72$ voxels, $p = 0.007$ (0.109) FWHM = 9.4 9.8 8.8 mm mm mm; 4.7 4.9 4.4 {voxels}
 Expected voxels per cluster, $<k> = 8.818$ Volume: 968848 = 121106 voxels = 1082.4 resels
 Expected number of clusters, $<c> = 0.12$ Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 100.45 voxels)
 FWEp: 6.369, FDRp: Inf, FWEc: 100, FDRc: 72

AMBER (1-back > 0-back)

Statistics: *p*-values adjusted for search volume

set-level		cluster-level				peak-level					mm mm mm		
<i>p</i>	<i>c</i>	<i>p</i> _{FWE-corr}	<i>q</i> _{FDR-corr}	<i>k</i> _E	<i>p</i> _{uncorr}	<i>p</i> _{FWE-corr}	<i>q</i> _{FDR-corr}	<i>T</i>	(<i>Z</i> _z)	<i>p</i> _{uncorr}			
0.000	8	0.000	0.000	975	0.000	0.001	0.015	8.00	5.58	0.000	42	-44	46
						0.054	0.035	6.30	4.83	0.000	14	-64	56
						0.066	0.035	6.20	4.78	0.000	34	-46	38
	0.000	0.000	1452	0.000		0.010	0.033	7.14	5.22	0.000	-32	-48	36
						0.038	0.035	6.48	4.92	0.000	-22	-60	44
						0.069	0.035	6.17	4.77	0.000	-38	-46	48
	0.000	0.000	930	0.000		0.017	0.033	6.88	5.11	0.000	30	22	10
						0.295	0.101	5.40	4.35	0.000	56	10	14
						0.392	0.105	5.22	4.26	0.000	48	12	12
	0.000	0.000	1262	0.000		0.034	0.035	6.54	4.95	0.000	-32	20	2
						0.036	0.035	6.50	4.93	0.000	-36	0	40
						0.054	0.035	6.30	4.83	0.000	-44	2	36
	0.000	0.000	347	0.000		0.093	0.041	6.02	4.69	0.000	36	36	26
						0.310	0.101	5.37	4.34	0.000	38	36	34
						0.340	0.101	5.31	4.31	0.000	42	30	30
	0.001	0.000	210	0.000		0.221	0.076	5.56	4.45	0.000	6	-82	-2
						0.717	0.166	4.76	3.98	0.000	-8	-86	2
	0.032	0.011	108	0.002		0.452	0.118	5.13	4.20	0.000	34	46	12
						0.997	0.550	3.96	3.46	0.000	32	52	6
	0.130	0.040	72	0.010		0.930	0.285	4.38	3.74	0.000	-30	44	12
						0.997	0.549	3.97	3.46	0.000	-36	54	16

table shows 3 local maxima more than 8.0mm apart

Height threshold: $T = 3.45$, $p = 0.001$ (1.000) Degrees of freedom = [1.0, 25.0]
 Extent threshold: $k = 72$ voxels, $p = 0.010$ (0.130) FWHM = 9.7 10.0 9.0 mm mm mm; 4.8 5.0 4.5 {voxels}
 Expected voxels per cluster, $<k> = 9.533$ Volume: 981528 = 122691 voxels = 1010.6 resels
 Expected number of clusters, $<c> = 0.14$ Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 108.59 voxels)
 FWEp: 6.339, FDRp: 5.863, FWEc: 108, FDRc: 72

Table 5. Statistics for the one-sample t-tests for the 1-back > 0-back contrasts. The table on the left presents the findings for each cluster during the blue light exposure condition, and the right table shows the same statistics during the amber condition.

Of interest, we also found that the amber condition led to a significant pattern of deactivation within the medial prefrontal cortex, posterior cingulate, and left parietal cortex, even after FDR cluster correction at $p < .05$ (see Figure 10). These regions correspond to the default mode network (DMN), which is normally deactivated during effortful task processing. Notably, there were no significant regions of deactivation within the brain for the blue group, suggesting that blue light may have reduced the normal suppression of DMN activation during this task.

AMBER (0-back > 1-back): Deactivation of DMN

0>1

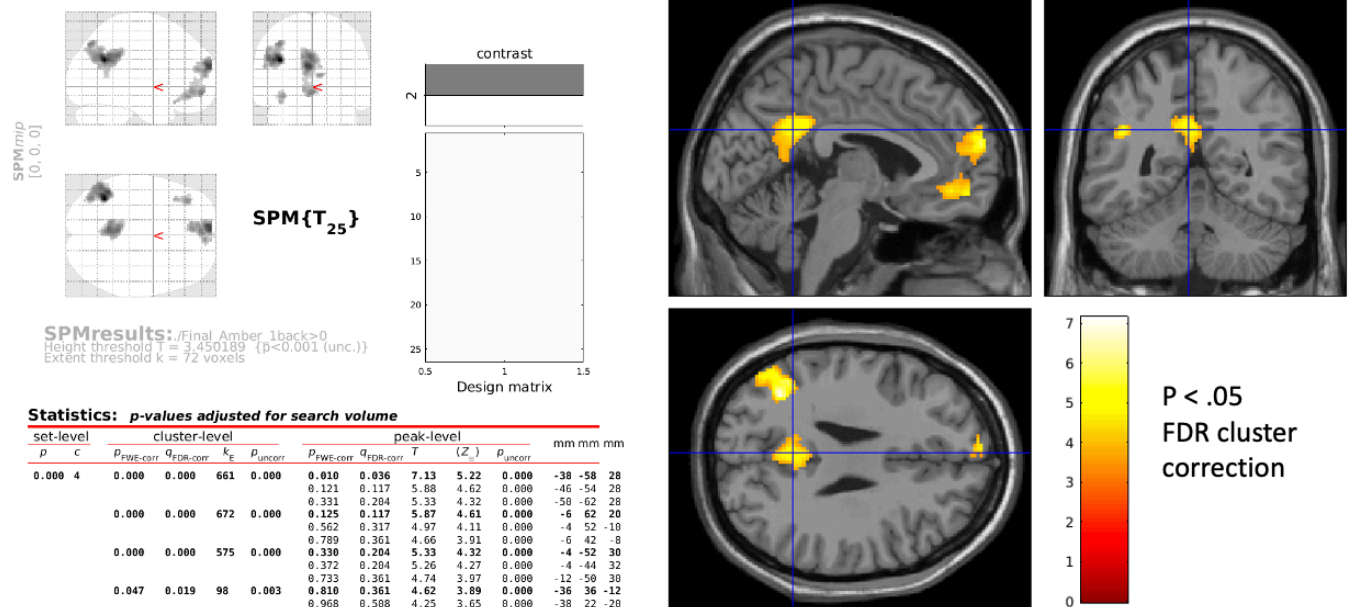


Figure 10. Outcomes for the negative activation pattern (i.e., 0-back > 1-back) for the amber light condition. This can be interpreted as the “deactivations” that occurred when the participants were actively engaged in the task. The regions of de-activation correspond to the medial prefrontal cortex, posterior cingulate gyrus, and left lateral parietal cortex, which comprise major hubs of the default mode network (DMN). The DMN normally is suppressed (deactivated) during working memory tasks such as the N-Back. This suggests that amber light is associated with typically expected decreases in DMN function.

Paired Samples T-Test (Blue vs. Amber). First, we compared the mean contrast maps for the 1-back > 0-back trials between the two light conditions. For the blue > amber comparison, we found two large clusters that showed statistically significant differences after correction for multiple comparisons ($p < .05$ FDR cluster correction). As shown in Figure 11, the contrast suggested that the blue group showed significantly greater activation of the DMN compared to the amber group. Figure 12 shows the full extent of these t-tests across the entire brain.

Blue > Amber (paired t-test): Greater DMN

Statistics: *p-values adjusted for search volume*

set-level		cluster-level				peak-level					mm mm mm		
<i>p</i>	<i>c</i>	<i>p</i> _{FWE-corr}	<i>q</i> _{FDR-corr}	<i>k</i> _E	<i>p</i> _{uncorr}	<i>p</i> _{FWE-corr}	<i>q</i> _{FDR-corr}	<i>T</i>	(<i>Z</i> _≡)	<i>p</i> _{uncorr}			
0.003	2	0.080	0.047	1343	0.001	0.913	0.999	4.37	3.73	0.000	-16	26	-6
						1.000	0.999	3.76	3.31	0.000	2	18	2
						1.000	0.999	3.70	3.27	0.001	8	60	10
		0.000	0.000	5075	0.000	0.958	0.999	4.24	3.64	0.000	-28	-4	18
						0.993	0.999	4.00	3.48	0.000	-50	-60	24
						0.999	0.999	3.80	3.34	0.000	-28	-34	22

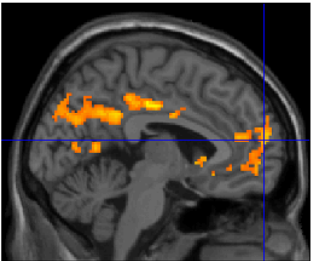
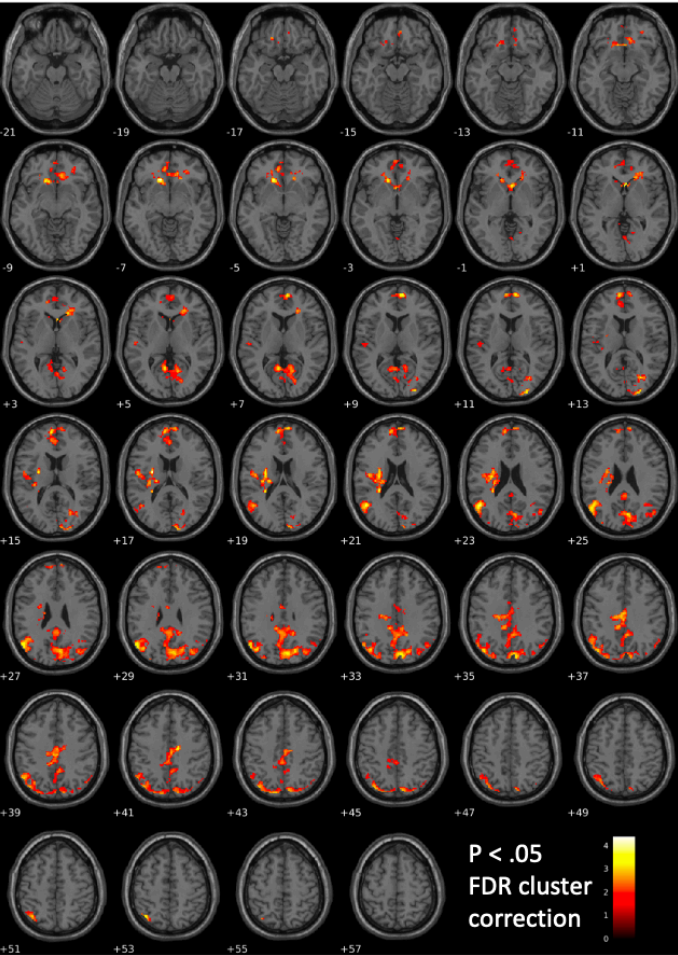


Figure 11. Paired t-test outcomes for the Blue > Amber contrast.

Blue > Amber (paired t-test): Greater DMN



Amber > Blue (paired t-test): No effect

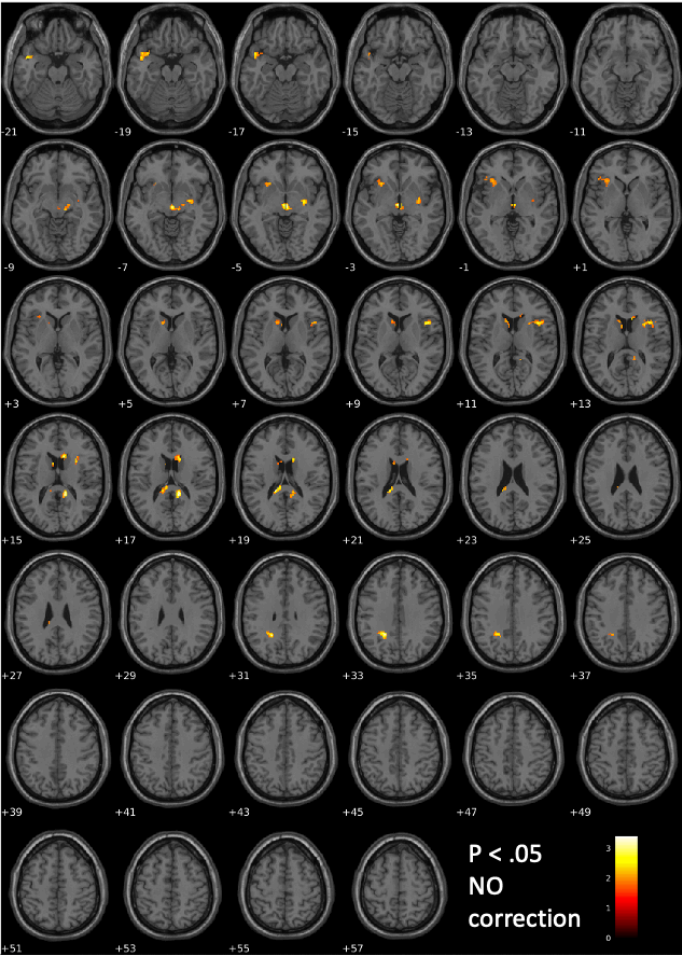


Figure 12. Paired t-test outcomes for the Blue > Amber contrast (left panel) and Amber > Blue contrast (right panel). As seen on the left, the Blue > Amber comparison showed that blue light was associated with significantly greater activation within the DMN relative to the amber light condition, with $p < .05$ cluster correction. However, there were few regions where amber light produced greater activation than blue., even when no correction for multiple comparisons was applied.

However, when the data were extracted and plotted for each cluster, it is clear that both the blue and amber conditions show deactivations relative to the 0-back condition (see Figure 13). This is normal and to be expected during task engagement from the N-Back task. However, the deactivation is much greater during amber than blue, suggesting that the significant difference in the brain activation maps is produced by significantly greater deactivation of DMN during the amber condition relative to the blue condition. When considered in light of our recent findings from another study where we found that blue light was associated with subsequent “neural efficiency” within the brain (Killgore et al., 2020), these findings further suggest that blue light may be contributing to a state of greater *neural efficiency* whereby there is less need for suppression of the DMN to accomplish the same level of working memory performance.

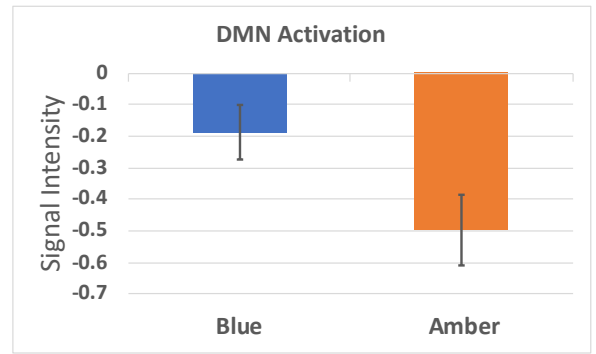


Figure 13. Data were extracted for the prefrontal cortex region shown for the Blue > Amber contrast. This figure shows that both blue and amber conditions were associated with decreased activation in the DMN, but that the deactivation was significantly attenuated (i.e., suppressed) in the blue condition compared to the amber condition.

When the inverse contrast was examined (i.e., amber > blue), we found no significant effects that survived correction for multiple comparisons. Figure 12 shows the whole brain activation pattern for the blue > amber contrast (left) and the amber > blue contrast (right). *Overall, these findings suggest that blue light appears to enhance neural efficiency by minimizing the suppression of the DMN during the very simple and minimally tasking working memory task (i.e., 1-back > 0-back). Thus, by facilitating neural efficiency, the blue light stimulation may allow the individual to put forth less effort to accomplish the same cognitive outcome.*

3-Back vs. 0-Back Trials

One-Sample T-Tests. We initially compared the mean contrast maps for the 3-back > 0-back trials for each light condition separately. This contrast represents the highest level of working memory load, as it involves comparing the current stimulus to each stimulus seen three trials previously. This task is extremely demanding and often leads to cognitive overload, failure, or disengagement due to frustration. Table 6 shows the outcome statistics from the one-sample t-tests and Figure 14 shows the uncorrected activation patterns at $p < .001$ (uncorrected height) with $p < .05$ FDR cluster correction for the blue and amber conditions separately, which allows simple inspection of the data. As evident in the figure, this extremely difficult task led to extremely similar activation patterns of task positive activation within each group overall, with activation evident in fronto-parietal attention networks regardless of light wavelength.

BLUE (3-back > 0-back)

Statistics: p -values adjusted for search volume

set-level		cluster-level				peak-level				mm mm mm		
p	c	$p_{\text{FWE-corr}}$	$q_{\text{FDR-corr}}$	k_E	p_{uncorr}	$p_{\text{FWE-corr}}$	$q_{\text{FDR-corr}}$	T	(Z_{c})	p_{uncorr}		
0.000	9	0.000	0.000	3837	0.000	0.000	0.002	9.23	6.04	0.000	42	26 36
						0.000	0.003	8.71	5.85	0.000	42	34 32
						0.011	0.011	7.13	5.22	0.000	38	34 22
		0.000	0.000	886	0.000	0.001	0.003	8.35	5.72	0.000	-6	20 46
						0.016	0.011	6.96	5.14	0.000	-18	20 32
						0.016	0.011	6.95	5.14	0.000	8	26 34
		0.000	0.000	3000	0.000	0.004	0.010	7.59	5.42	0.000	46	-44 50
						0.009	0.010	7.20	5.25	0.000	38	-48 50
						0.013	0.011	7.04	5.18	0.000	6	-66 50
		0.000	0.000	2051	0.000	0.006	0.010	7.40	5.34	0.000	-42	-46 48
						0.007	0.010	7.31	5.30	0.000	-46	-38 40
						0.046	0.017	6.42	4.89	0.000	-30	-58 42
		0.000	0.000	618	0.000	0.009	0.010	7.21	5.25	0.000	-30	18 2
						0.141	0.030	5.84	4.60	0.000	-16	2 14
						0.394	0.072	5.26	4.27	0.000	-24	10 14
		0.000	0.000	2632	0.000	0.026	0.013	6.71	5.03	0.000	-46	30 30
						0.029	0.013	6.65	5.00	0.000	-48	22 36
						0.045	0.017	6.43	4.90	0.000	-32	56 12
		0.001	0.000	190	0.000	0.083	0.024	6.12	4.74	0.000	10	-8 4
						0.824	0.182	4.64	3.90	0.000	10	-14 14
						0.947	0.269	4.37	3.73	0.000	8	-16 4
0.018	0.004	115	0.001			0.119	0.027	5.93	4.64	0.000	16	4 16
0.069	0.014	82	0.005			0.957	0.287	4.33	3.71	0.000	-8	-20 14
						0.972	0.314	4.27	3.66	0.000	-10	-16 6

AMBER (3-back > 0-back)

Statistics: p -values adjusted for search volume

set-level		cluster-level				peak-level				mm mm mm		
p	c	$p_{\text{FWE-corr}}$	$q_{\text{FDR-corr}}$	k_E	p_{uncorr}	$p_{\text{FWE-corr}}$	$q_{\text{FDR-corr}}$	T	(Z_{c})	p_{uncorr}		
0.000	8	0.000	0.000	3758	0.000	0.000	0.001	9.39	6.09	0.000	42	-38 44
						0.000	0.002	8.64	5.83	0.000	-34	-46 40
						0.000	0.002	8.49	5.77	0.000	32	-48 40
		0.000	0.000	530	0.000	0.005	0.005	7.43	5.35	0.000	-30	22 2
		0.000	0.000	1876	0.000	0.006	0.005	7.40	5.34	0.000	-46	32 32
						0.008	0.005	7.24	5.27	0.000	36	22 -6
						0.013	0.005	7.04	5.18	0.000	52	10 20
		0.000	0.000	1453	0.000	0.007	0.005	7.30	5.30	0.000	-36	6 32
						0.018	0.007	6.87	5.10	0.000	-42	4 40
						0.041	0.008	6.45	4.91	0.000	-38	20 22
		0.000	0.000	400	0.000	0.024	0.007	6.72	5.03	0.000	-32	56 10
						0.999	0.578	3.90	3.41	0.000	-38	44 12
		0.002	0.001	185	0.000	0.100	0.027	5.69	4.51	0.000	-10	26 32
						0.343	0.054	5.32	4.31	0.000	6	28 34
						0.985	0.398	4.16	3.59	0.000	10	32 22
		0.001	0.000	217	0.000	0.369	0.058	5.27	4.28	0.000	32	50 8
						0.975	0.375	4.22	3.63	0.000	24	56 6
						0.986	0.398	4.15	3.58	0.000	36	56 2
		0.020	0.004	120	0.001	0.727	0.153	4.76	3.98	0.000	14	-12 2
						0.764	0.167	4.70	3.94	0.000	6	-10 0
						0.997	0.524	3.99	3.48	0.000	12	-22 16

Table 6. Statistics for the one-sample t-tests for the 3-back > 0-back contrasts. The table on the left presents the findings for each cluster during the blue light exposure condition, and the right table shows the same statistics during the amber condition.

BLUE (3-back > 0-back)

AMBER (3-back > 0-back)

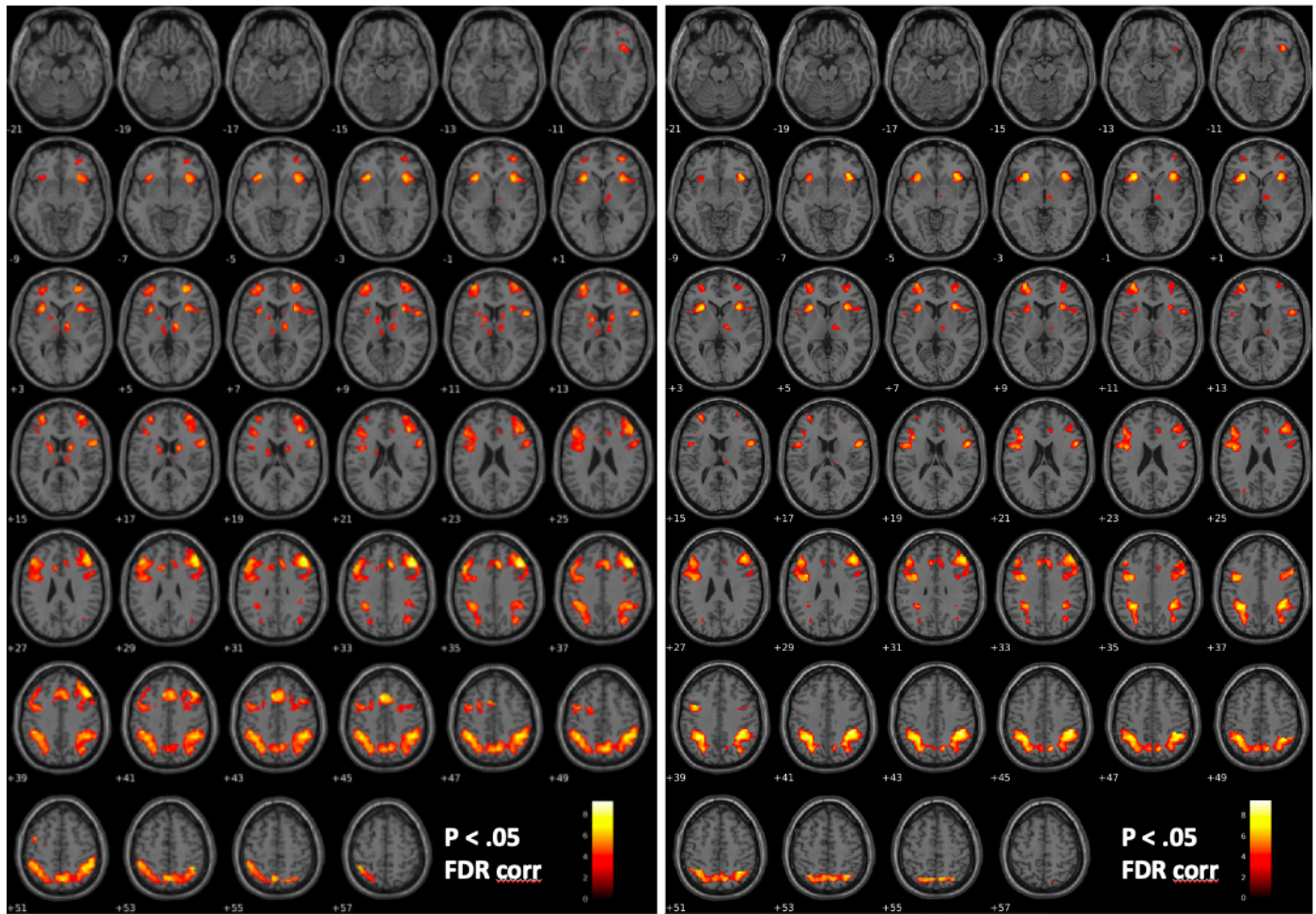


Figure 14. Multi-slice montage of the one-sample t-test outcomes of the 3-back > 0-back task. This contrast shows the brain regions that were more active during the much more demanding condition of the task for each of the two light conditions separately. The data are corrected for multiple comparisons with height $p < .05$ and cluster-wise correction at FDR $p < .05$.

For these extremely difficult working memory trials, we found that both the blue and amber conditions were associated with significant deactivation within the DMN regions, even after FDR cluster correction at $p < .05$ (see Figure 15 and Figure 16). This suggests that the task was much more demanding than the 1-back or 2-back conditions and led both groups to significantly disengage the DMN.

Paired Samples T-Test (Blue vs. Amber). We compared the mean contrast maps for the 3-back > 0-back trials between the two light conditions. For the blue > amber comparison, none of the analyses survived correction for multiple comparisons. For completeness in analysis, we dropped the statistical threshold to $p < .05$ (uncorrected) and employed a cluster threshold of $k \geq 100$ voxels. As shown in Figure 15, the contrast suggested that the blue group showed significantly greater activation of the within a variety of cortical and subcortical regions compared to the amber group. Similarly, the amber > blue contrast did not reach a corrected threshold of significance, but when the threshold was dropped to $p < .05$ (uncorrected) and a cluster threshold of $k \geq 100$ voxels, one cluster reached significance. This was a region within the left ventrolateral prefrontal cortex, which is often involved in working memory (see Figure 17).

BLUE (0-back > 3-back): Deactivation of DMN

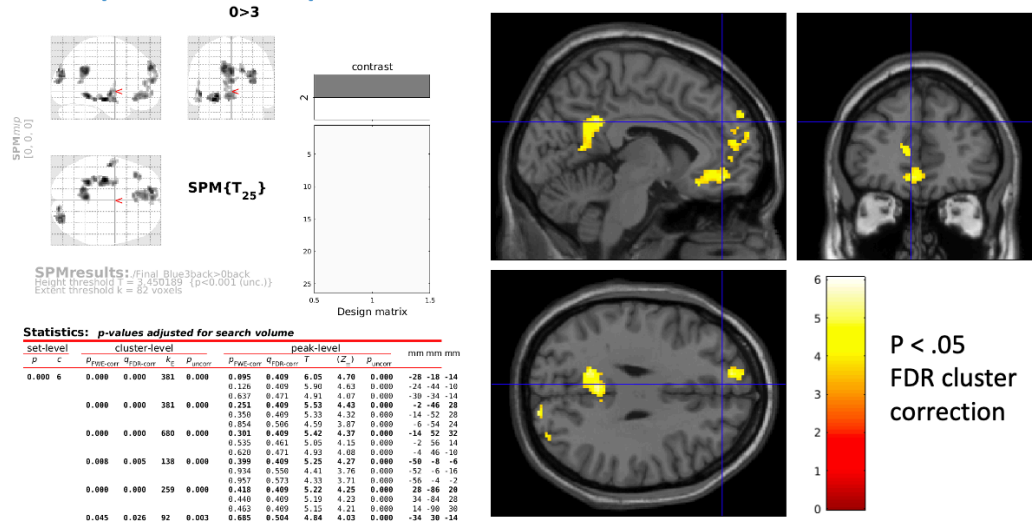


Figure 15. Outcomes for the negative activation pattern (i.e., 0-back > 3-back) for the amber light condition. This can be interpreted as the “deactivations” that occurred when the participants were actively engaged in the task. The regions of de-activation correspond to the medial prefrontal cortex, posterior cingulate gyrus, and left lateral parietal cortex, which comprise major hubs of the default mode network (DMN). The DMN normally is suppressed (deactivated) during working memory tasks such as the N-Back. This suggests that blue light is associated with typically expected decreases in DMN function when cognitive demand is high.

AMBER (0-back > 3-back): Deactivation of DMN

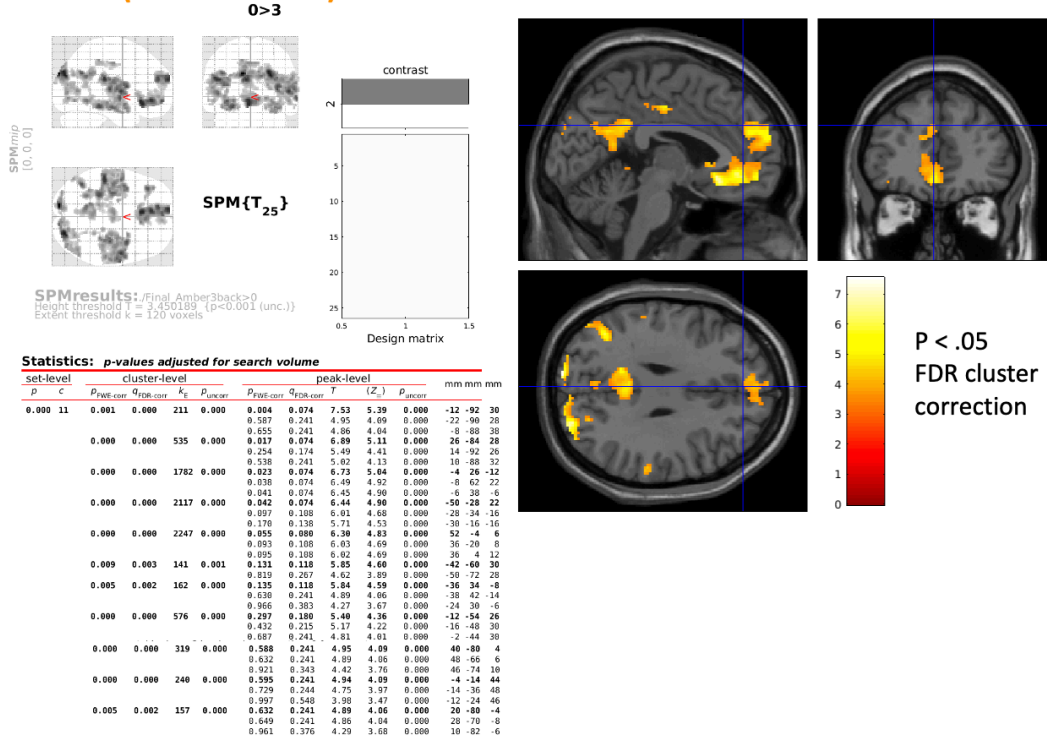


Figure 16. Outcomes for the negative activation pattern (i.e., 0-back > 3-back) for the amber light condition. This can be interpreted as the “deactivations” that occurred when the participants were actively engaged in the task. The regions of de-activation correspond to the medial prefrontal cortex, posterior cingulate gyrus, and left lateral parietal cortex, which comprise major hubs of the default mode network (DMN). The DMN normally is suppressed (deactivated) during working memory tasks such as the N-Back. This suggests that amber light is associated with typically expected decreases in DMN function when cognitive demand is high.

The average activation from that cluster was extracted and plotted. As shown in Figure 17, the amber group showed greater activation than the blue group within this ventrolateral prefrontal region during the very difficult 3-back > 0-back condition. This suggests that when the task demands become extremely difficult, the those receiving blue light required significantly less brain activation in this cognitive control region than those in the amber condition, consistent with the neural efficiency hypothesis.

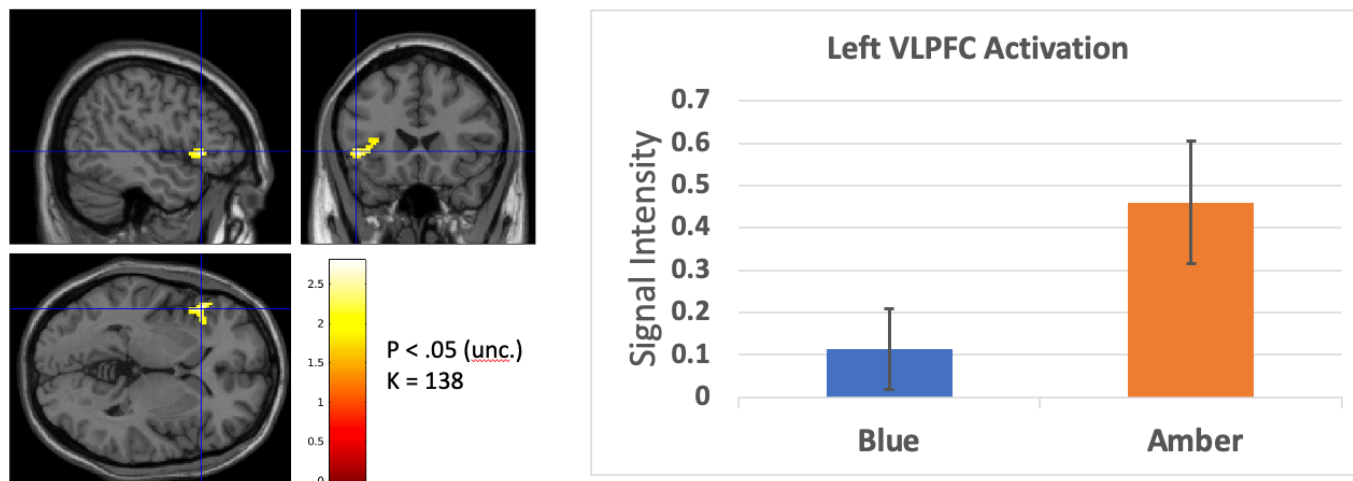


Figure 17. Paired t-test outcomes for the amber > blue contrast. A small region within the ventrolateral prefrontal cortex showed significantly greater activation during the amber condition relative to the blue.

Overall, while only suggestive due to the lack of corrected significance, these findings potentially suggest that blue light may further enhance neural efficiency by minimizing the required activation of the ventrolateral prefrontal cortex during the very demanding working memory task (i.e., 3-back > 0-back). Thus, by facilitating neural efficiency, the blue light stimulation may allow the individual to put forth less effort to accomplish the same cognitive outcome.

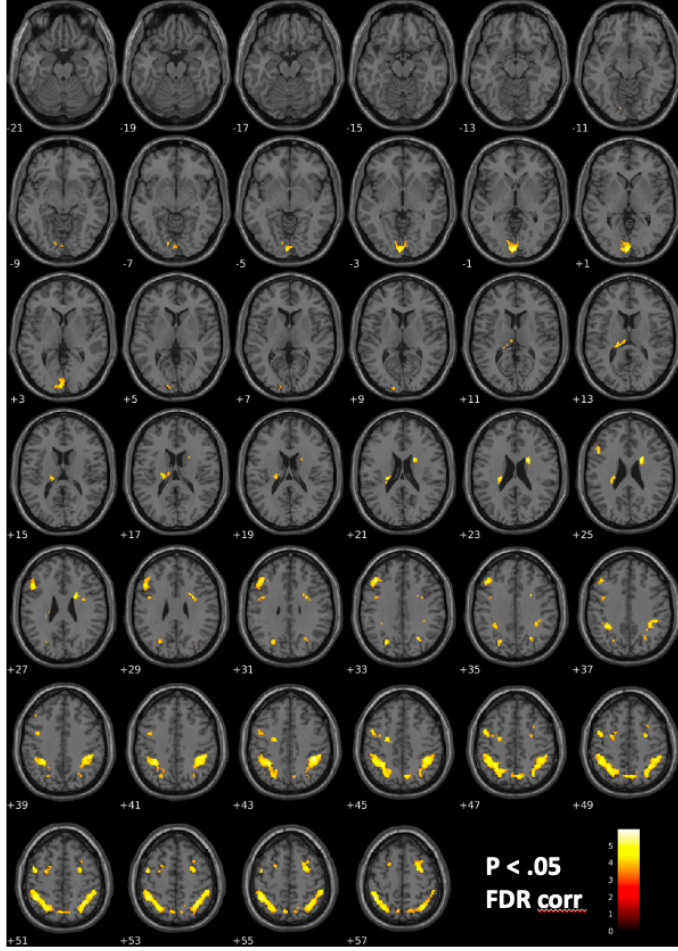
Reduced LC Data Set

The LC Set represents a reduced dataset that includes the LC region. This reduced dataset includes $n = 23$ participants with full brain coverage data that includes the LC.

1-Back vs. 0-Back Trials

One-Sample T-Tests. First, we compared the mean contrast maps for the 1-back > 0-back trials for each light condition separately. This contrast represents the lowest level of working memory load, as it only requires simple comparison between the current stimulus and the preceding stimulus. Figure 18 shows the uncorrected activation patterns at $p < .001$ (uncorrected height) with $p < .05$ FDR cluster correction for the blue and amber conditions separately, which allows simple inspection of the data. As evident in Figure 18, this simple task led to similar activation patterns of task positive activation within each group overall. While activation was minimally apparent in the prefrontal regions for the blue group, the amber group showed significant regions of activation within prefrontal areas. The statistics for each of these analyses are presented in Table 7.

BLUE (1-back > 0-back)



AMBER (1-back > 0-back)

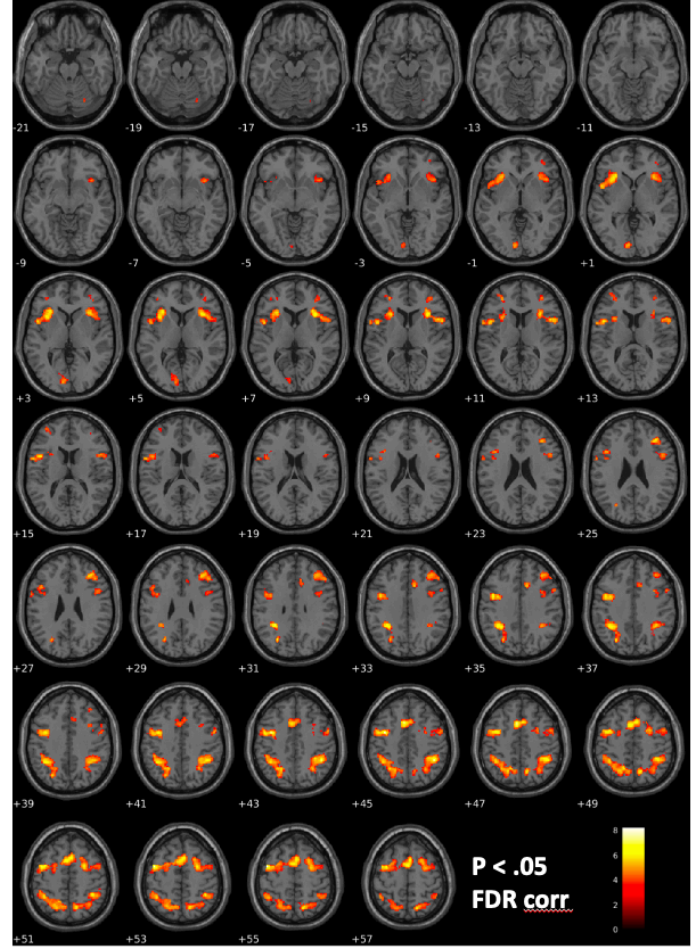


Figure 18. Multi-slice montage of the one-sample t-test outcomes of the 1-back > 0-back task for the reduced LC Data Set. This contrast shows the brain regions that were more active during the more demanding condition of the task for each of the two light conditions separately. The data are corrected for multiple comparisons with height $p < .05$ and cluster-wise correction at FDR $p < .05$.

BLUE (1-back > 0-back)

Statistics: p -values adjusted for search volume

set-level		cluster-level				peak-level				mm mm mm			
p	c	$P_{FWE-corr}$	$q_{FDR-corr}$	k_E	P_{uncorr}	$P_{FWE-corr}$	$q_{FDR-corr}$	T	(Z_c)	P_{uncorr}			
0.000	10	0.042	0.017	104	0.002	0.312	0.508	5.95	4.46	0.000	20	4	24
						0.946	0.548	4.75	3.84	0.000	24	4	36
						0.984	0.620	4.55	3.73	0.000	32	0	28
		0.000	0.000	1185	0.000	0.349	0.508	5.87	4.42	0.000	38	-40	44
						0.485	0.508	5.61	4.30	0.000	34	-54	52
						0.654	0.531	5.34	4.16	0.000	50	-36	54
		0.000	0.000	243	0.000	0.366	0.508	5.83	4.41	0.000	-4	-92	0
						1.000	0.802	3.97	3.37	0.000	-12	-82	-6
						0.999	0.697	4.25	3.54	0.000	-42	2	30
		0.005	0.003	163	0.000	0.419	0.508	5.73	4.36	0.000	-46	-2	54
						0.997	0.697	4.33	3.60	0.000	-40	0	40
						0.999	0.697	4.25	3.54	0.000	-42	2	30
		0.000	0.000	1236	0.000	0.437	0.508	5.70	4.34	0.000	-32	-50	48
						0.551	0.508	5.50	4.25	0.000	-44	-46	58
						0.722	0.531	5.23	4.11	0.000	-30	-58	50
0.001	0.001	0.000	0.000	214	0.000	0.538	0.508	5.53	4.26	0.000	-42	28	34
						0.899	0.541	4.89	3.92	0.000	-48	20	28
0.000	0.000	0.000	0.000	318	0.000	0.595	0.508	5.43	4.21	0.000	28	2	66
						0.771	0.531	5.15	4.06	0.000	28	0	58
						0.964	0.548	4.68	3.80	0.000	26	-4	50
		0.023	0.011	120	0.001	0.776	0.531	5.14	4.06	0.000	-26	-26	24
						0.984	0.620	4.55	3.73	0.000	-18	-24	14
						0.995	0.692	4.40	3.64	0.000	-8	-22	14
0.001	0.000	0.000	0.000	233	0.000	0.781	0.531	5.13	4.05	0.000	46	-60	32
						0.838	0.537	5.03	4.00	0.000	32	-58	-26
						0.930	0.548	4.81	3.87	0.000	32	-44	-34
0.025	0.011	0.000	0.000	118	0.001	0.905	0.541	4.88	3.91	0.000	-24	-8	46
						0.997	0.697	4.35	3.61	0.000	-22	4	54
						0.999	0.697	4.24	3.54	0.000	-30	-2	50

AMBER (1-back > 0-back)

Statistics: p -values adjusted for search volume

set-level		cluster-level				peak-level				mm mm mm			
p	c	$P_{FWE-corr}$	$q_{FDR-corr}$	k_E	P_{uncorr}	$P_{FWE-corr}$	$q_{FDR-corr}$	T	(Z_c)	P_{uncorr}			
0.000	10	0.000	0.000	4138	0.000	0.007	0.040	8.20	5.37	0.000	-44	2	56
						0.008	0.040	8.14	5.35	0.000	-38	0	46
						0.013	0.040	7.87	5.25	0.000	-6	14	48
		0.000	0.000	1319	0.000	0.016	0.040	7.75	5.21	0.000	42	-44	46
						0.161	0.089	6.38	4.66	0.000	10	-62	50
						0.368	0.103	5.82	4.40	0.000	32	-42	44
		0.000	0.000	1721	0.000	0.063	0.070	6.98	4.91	0.000	-32	-44	32
						0.122	0.084	6.56	4.74	0.000	36	-48	38
						0.181	0.091	6.31	4.63	0.000	-16	-56	50
		0.000	0.000	918	0.000	0.097	0.084	6.71	4.80	0.000	32	20	8
						0.327	0.102	5.91	4.44	0.000	48	12	10
						0.472	0.120	5.63	4.31	0.000	38	28	10
		0.000	0.000	386	0.000	0.294	0.097	5.98	4.48	0.000	36	36	26
						0.730	0.186	5.22	4.10	0.000	34	36	36
						0.746	0.187	5.19	4.08	0.000	42	30	28
0.008	0.004	0.000	0.000	155	0.000	0.454	0.116	5.66	4.32	0.000	-10	-86	2
						1.000	0.751	3.85	3.29	0.001	-16	-78	6
0.105	0.029	84	0.005			0.547	0.132	5.51	4.25	0.000	-32	-60	-30
0.101	0.029	85	0.005			0.899	0.250	4.89	3.92	0.000	-28	46	10
						0.999	0.400	4.26	3.55	0.000	-34	52	16
						1.000	0.580	4.08	3.44	0.000	-38	44	6
0.042	0.016	108	0.002			0.950	0.280	4.73	3.83	0.000	28	-60	-30
						1.000	0.590	4.05	3.42	0.000	24	-72	-20
0.101	0.029	85	0.005			0.950	0.280	4.73	3.83	0.000	34	46	12
						1.000	0.629	4.00	3.39	0.000	38	42	4

Table 7. Statistics for the one-sample t-tests for the 1-back > 0-back contrasts. The table on the left presents the findings for each cluster during the blue light exposure condition, and the right table shows the same statistics during the amber condition.

There was no significant deactivation associated with this 1-back > 0-back trial contrast for the blue group. However, as shown in Figure 19, for amber light, there was a significant decrease in activation within the default mode network (DMN), including regions of the medial prefrontal cortex, posterior cingulate/precuneus, and left parietal cortex.

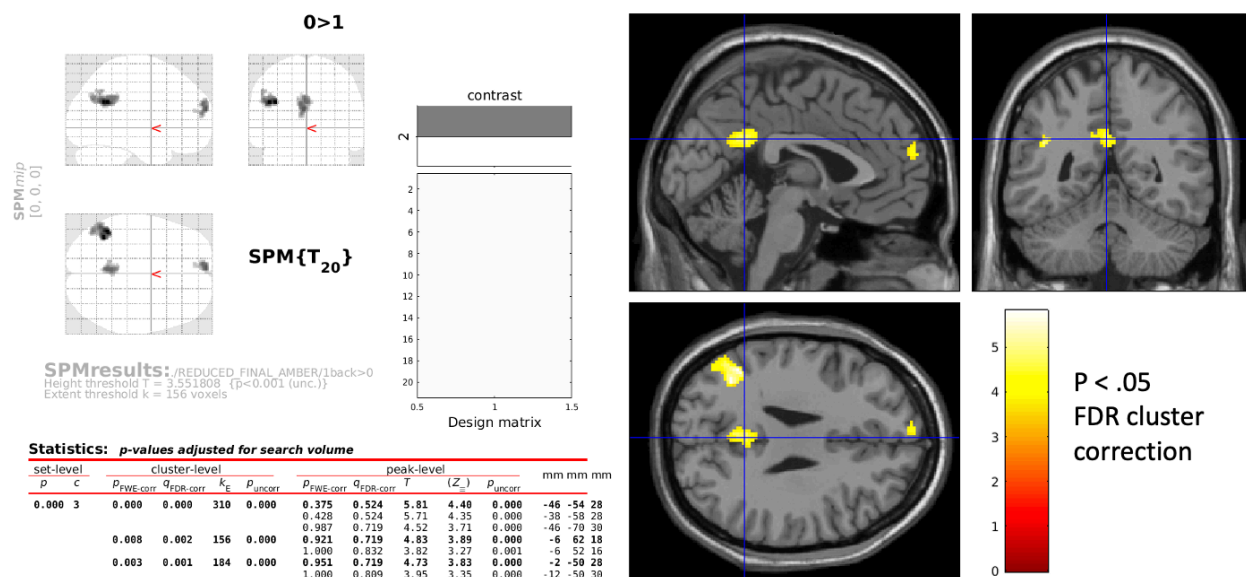


Figure 19. Outcomes for the negative activation pattern (i.e., 0-back > 1-back) for the amber light condition. This can be interpreted as the “deactivations” that occurred when the participants were actively engaged in the task. The regions of de-activation correspond to the medial prefrontal cortex, posterior cingulate gyrus, and left lateral parietal cortex, which comprise major hubs of the default mode network (DMN). The DMN normally is suppressed (deactivated) during working memory tasks such as the N-Back. This suggests that amber light is associated with typically expected decreases in DMN function.

Paired Samples T-Test (Blue vs. Amber). First, we compared the mean contrast maps for the 1-back > 0-back trials between the two light conditions. Figure 20 shows that for the blue > amber comparison, we found one large cluster in the posterior parietal cortex that showed statistically significant differences after correction for multiple comparisons ($p < .05$ FDR cluster correction). As shown in the figure, the contrast suggested that the blue group showed significantly greater activation of the posterior parietal cortex compared to the amber group. When the data were extracted and plotted for each cluster, it is evident that this difference was driven primarily by an increase in parietal activation of the blue group and a minimal decline in activation in the amber group (see Figure 21).

Blue > Amber (paired t-test): No effect

Amber > Blue (paired t-test): No effect

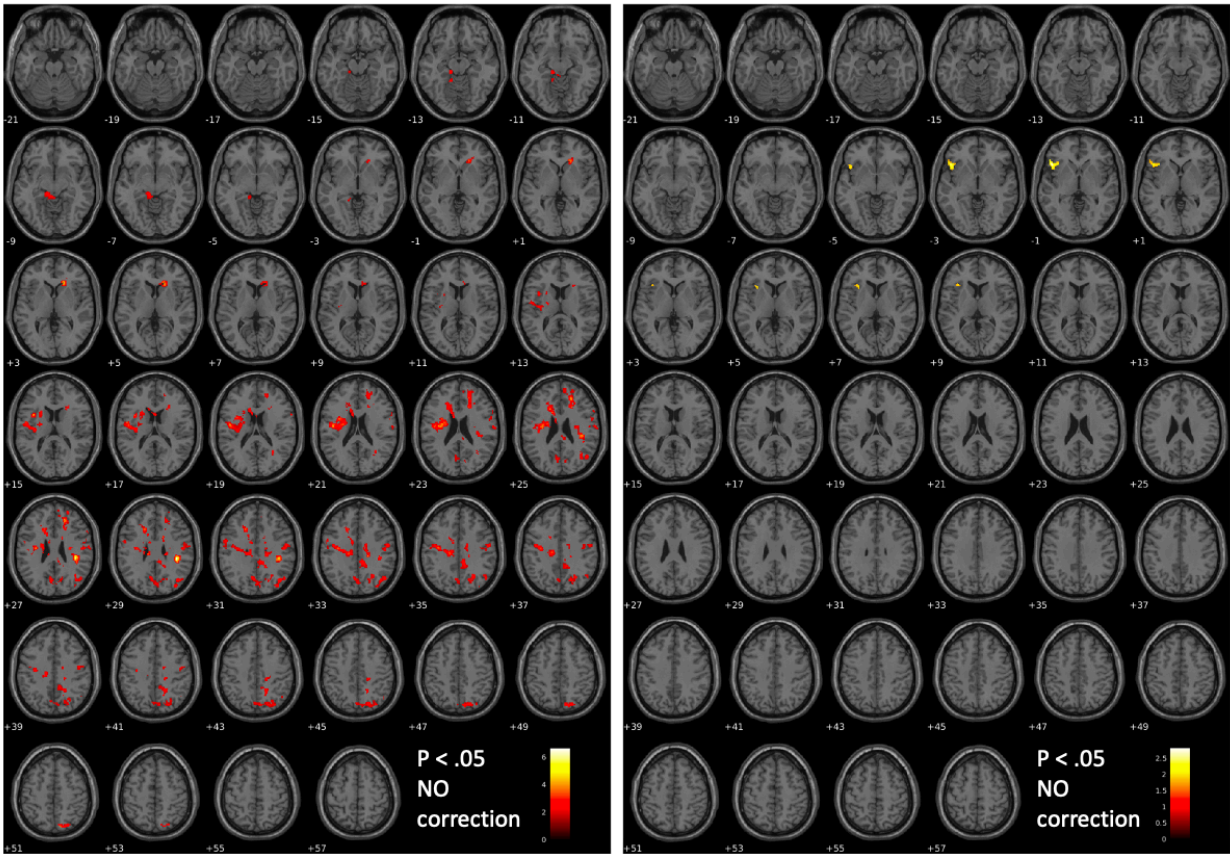


Figure 20 Paired t-test outcomes for the Blue > Amber contrast (left panel) and Amber > Blue contrast (right panel). As seen on the left, the Blue > Amber comparison showed that blue light was associated with greater activation in a variety of brain regions, but not at a corrected level of significance. However, the only region that showed increased activation for amber light was a cluster of activation in the ventrolateral prefrontal cortex.

Blue > Amber (paired t-test): Greater Parietal Activation

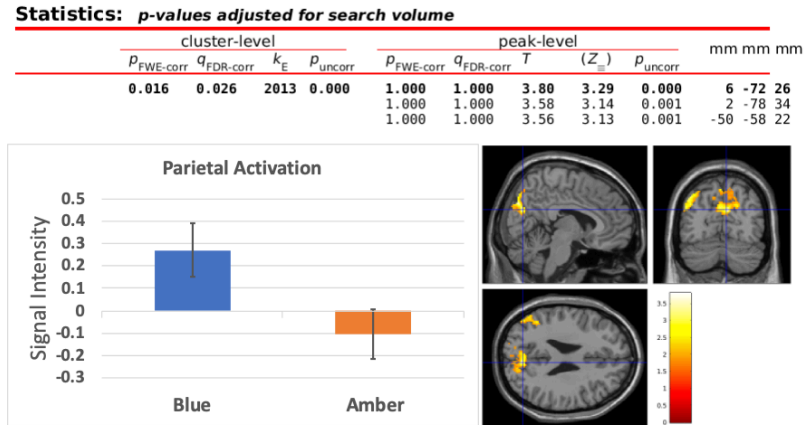


Figure 21. The Blue > Amber paired t-test outcomes showed that blue light was associated with significantly greater activation in the superior occipital/posterior parietal region.

LC ROI Analysis. Here we focused specifically on the locus coeruleus (LC) region of the brainstem. For this analysis, we restricted our analysis only to the brainstem region by setting a region-of-interest (ROI) from the PickAtlas Utility implemented in SPM12. The general location of the LC is shown on the left in Figure 22, while the ROI for the current analysis is shown on the right in green.

As above, we conducted a paired t-test between the blue and amber conditions for the 1-back > 0-back trials, restricting our analysis to the a priori hypothesized region of the brainstem, focusing on the LC region. Because this region was predicted a priori, we maintained a liberal $p < .05$ height threshold, with $k \geq 10$. As shown in Figure 23, this analysis revealed a modest difference between the blue and amber conditions for activation within a region of the LC.

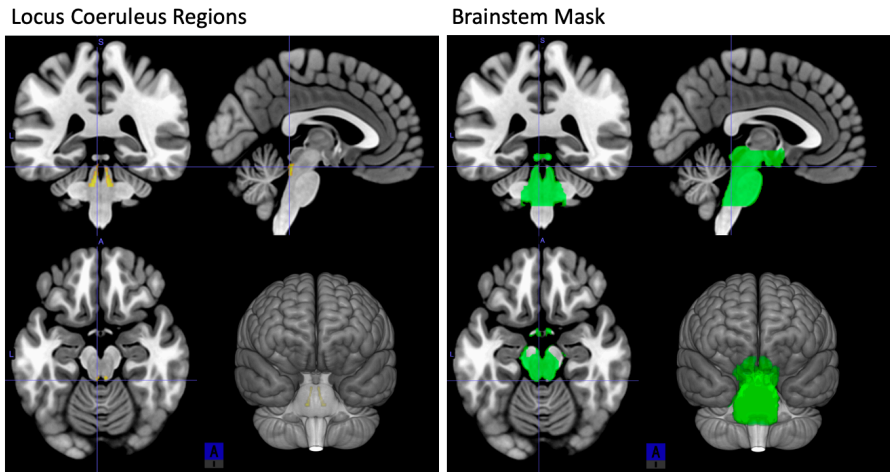


Figure 22. Regions of interest for the LC.

Blue > Amber (paired t-test): Brainstem ROI–LC Activation

1-back > 0-back

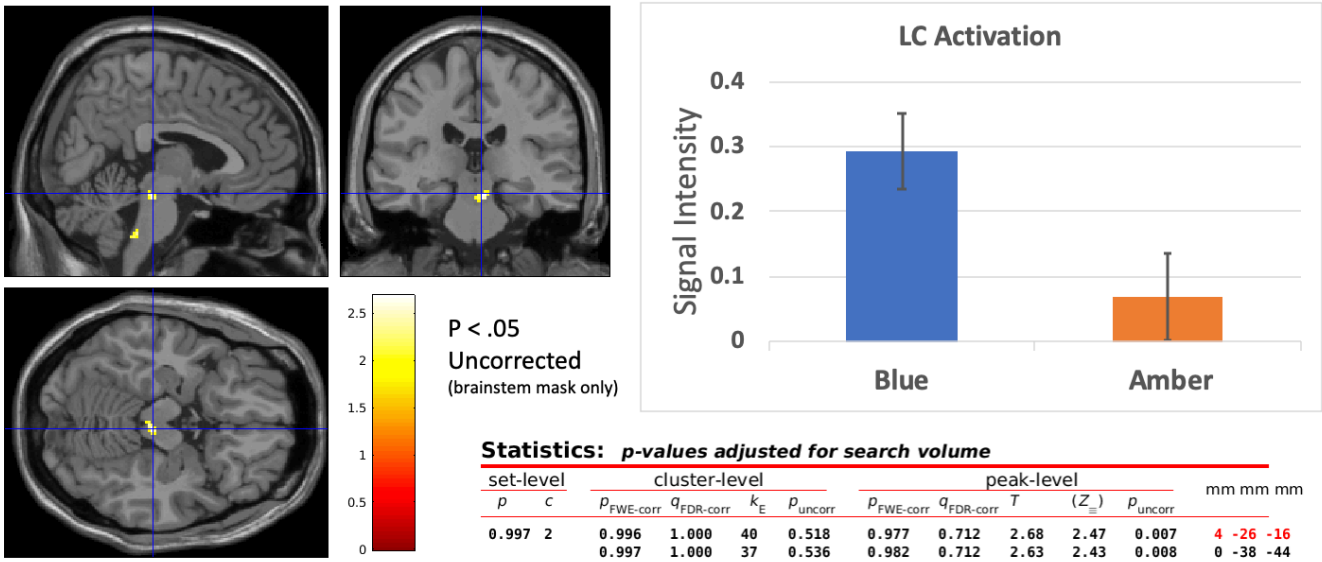


Figure 22. Blue light was associated with significantly greater activation in the region corresponding to the LC during he 1-back > 0-back condition.

Overall, the blue condition was associated with greater responses of the LC relative to the amber condition, as hypothesized. *This finding suggests that at this very low level of cognitive effort (1-back > 0-back), acute exposure to blue light appears to produce greater activation within brainstem regions that correspond to the location of the locus coeruleus, providing preliminary support for the potential mechanism of norepinephrine activation in the acute alerting effect of blue light.*

2-Back vs. 0-Back Trials

Next, we conducted the same paired t-test between the blue and amber conditions for the 2-back > 0-back trials, again restricting our analysis to the a priori hypothesized region of the brainstem and LC region. Again, we maintained a liberal $p < .05$ height threshold, with $k \geq 10$ because this region was predicted a priori. As shown in Figure 23, this analysis showed a modestly greater response of the LC relative to the amber condition, as hypothesized. *This finding suggests that at this very moderate level of cognitive effort (2-back > 0-back), acute exposure to blue light appears to produce greater activation*

within brainstem regions that correspond to the location of the locus coeruleus, providing preliminary support for the potential mechanism of norepinephrine activation in the acute alerting effect of blue light.

Blue > Amber (paired t-test): Brainstem ROI-LC Activation

2-back > 0-back

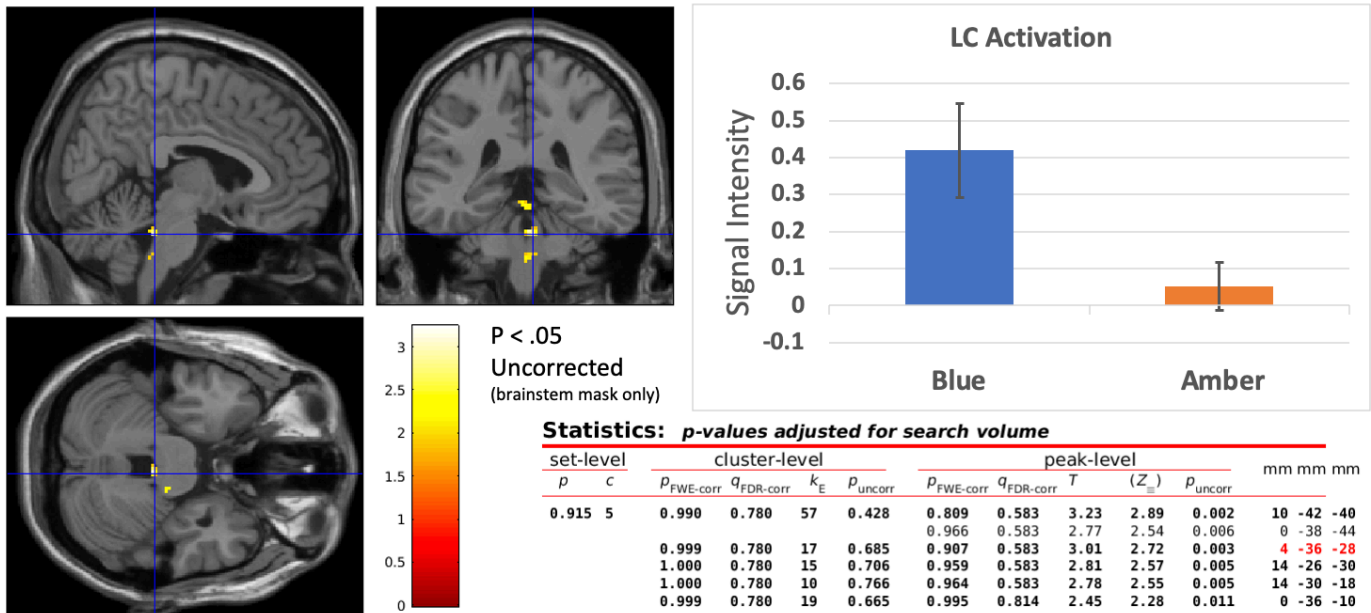


Figure 23. Blue light was associated with significantly greater activation in the region corresponding to the LC during the 2-back > 0-back condition.

3-Back vs. 0-Back Trials

Finally, we also conducted a paired t-test between the blue and amber conditions for the extremely difficult 3-back > 0-back trials, restricting our analysis to the a priori hypothesized region of the brainstem, again focusing on the LC region. As this region was predicted a priori, we maintained a liberal $p < .05$ height threshold, with $k \geq 10$. As shown in Figure 24, this analysis revealed a difference between the blue and amber conditions for activation within a region of the LC, but not when corrected for multiple comparisons. Overall, the blue condition was associated with greater responses of the LC relative to the amber condition, as hypothesized. *This finding suggests that at this extremely difficult level of cognitive effort (3-back*

Blue > Amber (paired t-test): Brainstem ROI-LC Activation

3-back > 0-back

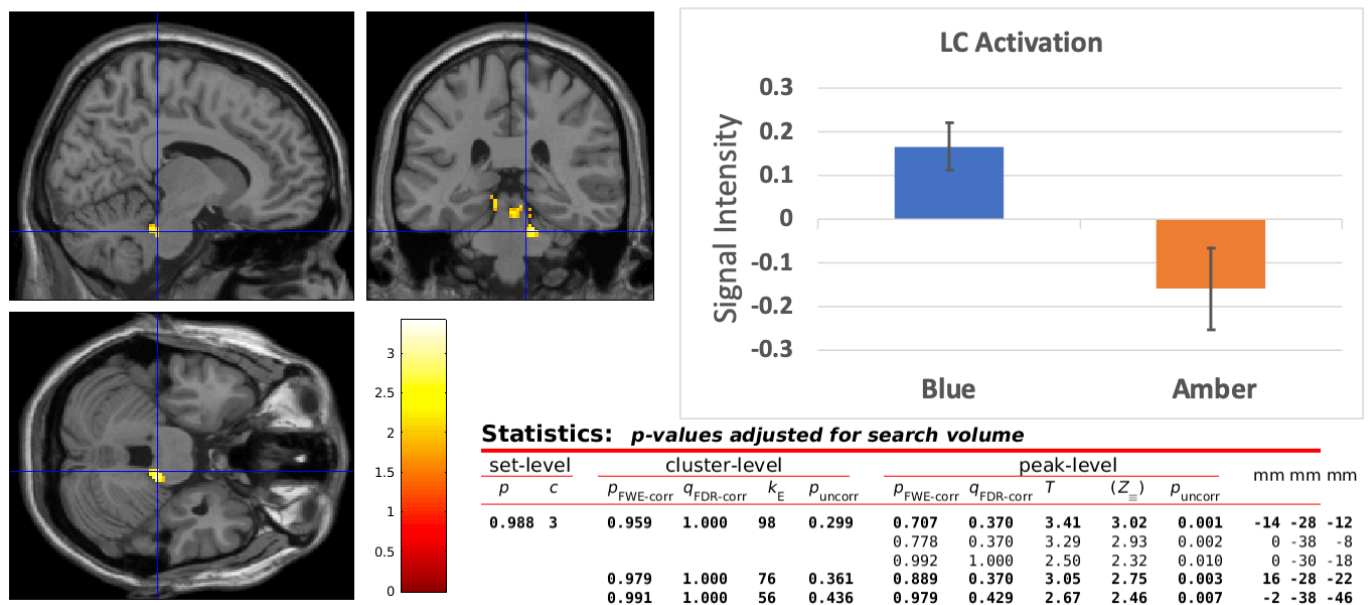


Figure 24 Blue light was associated with significantly greater activation in the region corresponding to the LC during the 3-back > 0-back condition.

> 0-back), acute exposure to blue light also produced greater activation within brainstem regions that correspond to the location of the locus coeruleus, providing preliminary support for the potential mechanism of norepinephrine activation in the acute alerting effect of blue light.

N-Back Performance: A critical issue for interpretation is whether there were significant differences between the blue and amber groups with regard to performance on the task itself. If performance was as good or better for the blue condition relative to the amber condition, this would suggest that the changes in neuroimaging would be suggestive of neural efficiency. Therefore, we extracted the performance metrics for each condition of the N-Back and calculated the percent correct for each. As shown in figure 25, the 2-back and 3-back conditions were performed at a significantly lower accuracy than the 0-back or 1-back conditions. However, there was no significant difference between the blue and amber conditions, suggesting that they performed equally well, despite the fact that the blue group showed significantly less suppression of the DMN. This supports the neural efficiency hypothesis.

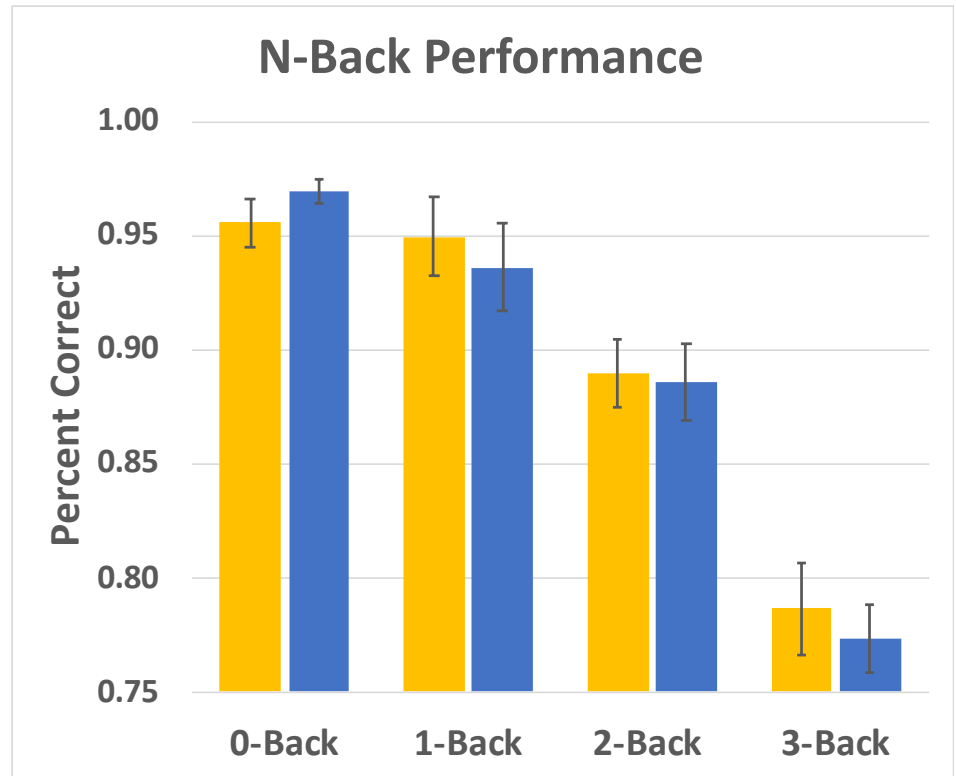


Figure 25. Performance on the various conditions of the N-Back Task. While more difficult trials were scored worse than easier trials, there was not significant difference between blue and amber groups in terms of accuracy of performance.

Conclusion: The neuroimaging findings suggest that blue light was associated with reduced suppression of the DMN and increased activation within a brainstem region that is associated with the LC, despite no differences in accuracy between conditions. These findings are consistent with the hypothesis that blue light produces acute activation of the norepinephrine system, which may in turn, lead to greater neural efficiency when engaged in cognitive tasks involving working memory.

Pupillometric Measurement of Norepinephrine

We included a measure of pupil size change as a proxy for norepinephrine release during the various tasks. Increased in pupil size are taken to reflect increases in norepinephrine. Relevant methods and findings are described below:

Pupil Size

Pupil size was measured using an MRI-compatible EyeLink 1000 Eye Tracker (see Figure 26). The stand holds the illuminator that casts infrared wavelength light (940 nm) to the eye. A fiber optic camera detects the infrared wavelength light reflected by the eye. The stand, with the illuminator and camera was placed at the end of the 3T MRI bore, with a distance of ~127 cm from the camera to the eye. The pupil diameter was measured from the

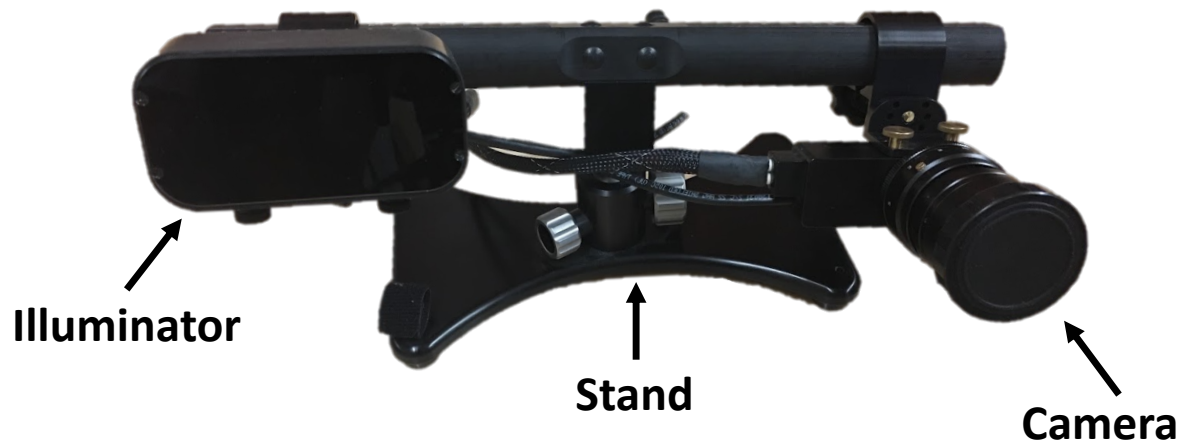


Figure 26. The EyeLink 1000 is compatible with 3T magnetic resonance imaging (MRI) and includes a stand, illuminator and camera.

dominate, right eye. To avoid shadows cast by the 32-channel head coil, the illuminator was placed on the right side of the stand and the camera was placed on the left side of the stand. The participant was positioned in the head coil so that the right eye was fully visible and not occluded by the coil or the mirror. Foam pads were placed around the head in the coil to reduce head movement and minimize motion artifacts during scan acquisition. Slight head movement can cause the eye to become occluded by the head coil and the pupil unable to be detected by the camera. This type of movement can result in missing pupil diameter measures.

Standard eye tracking protocols were employed as part of the setup process, including thresholding, calibration, and validation. Viewed on a monitor in the console room, research staff checked the image of the right eye to ensure pupil and corneal reflection (CR) thresholds were within an acceptable range (see Figure 27). The pupil threshold value was adjusted to ≥ 75 and the CR threshold value was < 240 . The position of the participant, camera and/or illuminator were adjusted until threshold levels were met. Pupil diameter was measured using the EyeLink software and is shown in blue (see Figure 27). After pupil and CR threshold values were reached, 9-point calibration was conducted and verified. The setup process varied in length from one participant to the next. For resting state functional magnetic resonance

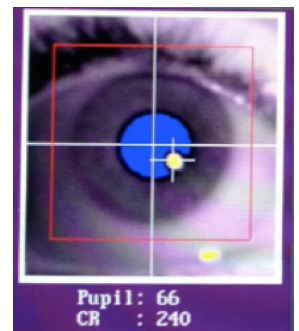


Figure 27. Eyelink software shows eye image with pupil in blue. Pupil and Corneal Reflection (CR) threshold values reported below the image.

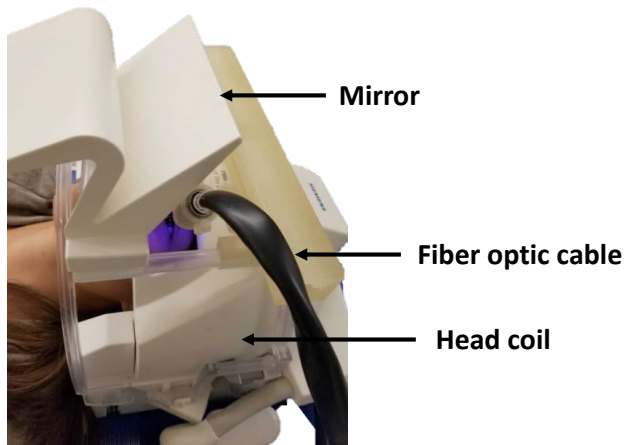


Figure 28. A fiber optic cable attached to the 32-channel head coil was used to present blue or amber wavelength light during MRI scanning. A fixation cross was viewed through the mirror affixed to the head coil.

imaging (rs-fMRI), a white fixation cross was presented on a black background. Participants were instructed to remain still as possible, let their thoughts come and go, and keep their eyes open, fixated on the cross.

During rs-fMRI, participants received intermittent light exposure to the left eye through a fiber optic cable attached to the MRI head coil (see Figure 28). Pupil size was measured from the right eye at a sampling rate of 1000 Hz during the 12-minute rs-fMRI scan. Light was presented in 30 second intervals, starting with the light off. Based on randomization to the experimental condition, participants received either blue wavelength light at Session 1 followed by amber wavelength light at Session 2, or amber wavelength light at Session 1 followed by blue wavelength light at Session 2. The experimental design for the rs-fMRI

session is shown below in Figure 29. The following sections provide an overview of the analyses performed on pupil size measures and the preliminary findings.

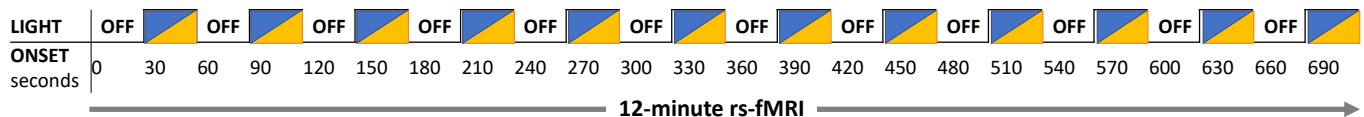


Figure 29. Experimental design for the resting state functional magnetic resonance imaging (rs-fMRI) session.

Effects of Blue Light Exposure on Pupil Size: One of the major goals of the study was to determine the effects of blue wavelength light exposure on the release of norepinephrine, as indexed by pupil size. We hypothesized that exposure to blue versus placebo wavelength light would lead to immediate increases in norepinephrine, as measured by pupil dilation.

To assess pupil size, participants were exposed to 30 second blocks of alternating light off and light on. Pupil sizes during light off blocks were averaged together to provide a baseline measure of pupil size. Measures of pupil size during each light on block were normalized to baseline.

Pupil Size Across Sessions: Changes in pupil size were analyzed using a 2 (Session 1, Session 2) x 12 (Light-On Blocks 1-12) repeated-measures ANOVA (see Figure 30). Mauchly's test indicated that the assumption of sphericity was violated for Session 1 ($X^2(65) = 105.04, p = .002$) and Session 2 ($X^2(65) = 129.12, p < .001$). Therefore, Greenhouse-Geisser corrected tests are reported. Results showed a significant main effect of block on pupil size in Session 1 $F(5.96, 143.22) = 2.93, p = .01, \eta^2 = .11$. Post-hoc analyses indicated pupil size measured in the second light exposure block was significantly reduced when compared to pupil size in the initial light exposure block $F(1, 24) = 6.98, p = .014, \eta^2 = .225$. A similar trend in the reduction of pupil size from light exposure block 1 to light exposure block 2 can be seen in Session 2, however, this finding did not reach statistical significance ($F(4.88, 117.21) = 1.34, p = .25, \eta^2 = .05$).

In Session 1, we found a significant block x condition interaction $F(5.96, 143.22) = 3.01, p = .009, \eta^2 = .111$. Post-hoc analyses indicated significant changes in pupil size from block 2 versus block 3 $F(1, 24) = 6.66, p = .02, \eta^2 = .22$. As shown in Figure 30, individuals in the amber placebo light condition showed a reduction in pupil size between blocks 2-3, whereas participants in the blue light condition showed a slight increase between the same blocks. Significant changes in pupil size were also found between block 5 versus block 6 $F(1, 24) = 4.30, p = .05$,

$\eta^2 = .15$. Participants in the blue condition showed a reduction in pupil size between light exposure blocks 5-6, whereas participants in the amber condition showed a slight increase between the same blocks.

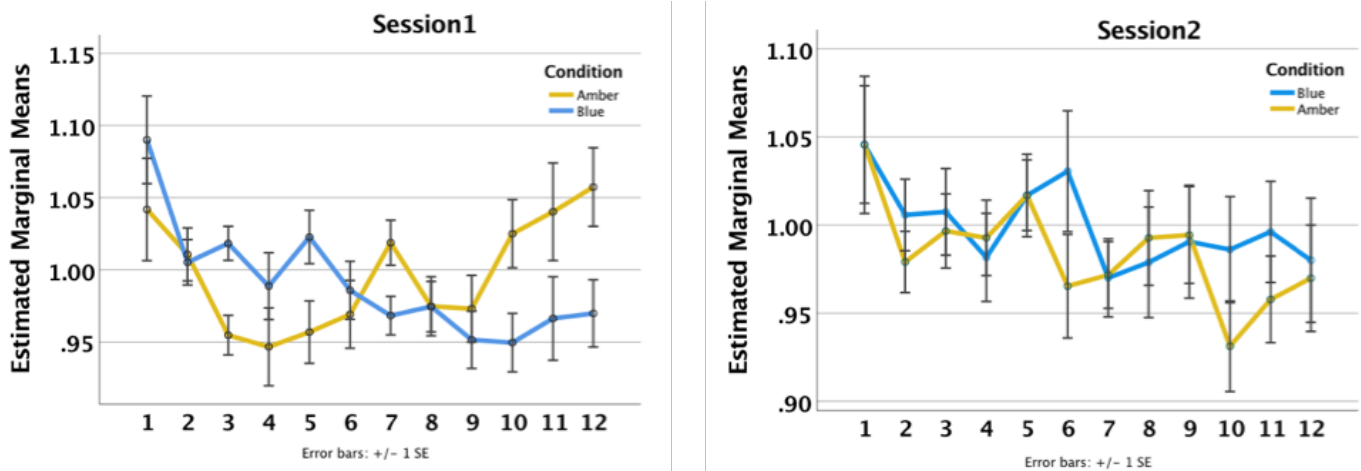


Figure 30. Pupil size normalized to baseline during blue or amber wavelength light exposure in Session 1 (left) and Session 2 (right). In the crossover design, participants who received blue light in Session 1 were then exposed to amber placebo light in Session 2. Each of the 12 light exposure blocks were 30 seconds in duration.

Pupil Size Across Light Exposure: To assess overall pupil changes during blue versus amber wavelength light, we collapsed data across sessions and conducted a repeated-measures 2 (Blue, Amber) $\times$ 12 (Light-On Blocks 1-12) ANOVA (see Figure 31). Mauchly's test indicated that the assumption of sphericity was violated for the blue ($X^2(65) = 142.32, p < .001$) and amber ($X^2(65) = 141.21, p < .001$) conditions. Therefore, Greenhouse-Geisser corrected tests are reported. Results showed a significant main effect of block on pupil size during blue light exposure $F(4.93, 123.35) = 3.08, p = .01, \eta^2 = .11$. Compared to the first light block, there was a significant reduction in pupil size for each subsequent light block. Although a similar trend was observed in the amber condition, the main effect of block on pupil size was not statistically significant $F(5.48, 136.97) = 1.24, p = .28, \eta^2 = .05$.

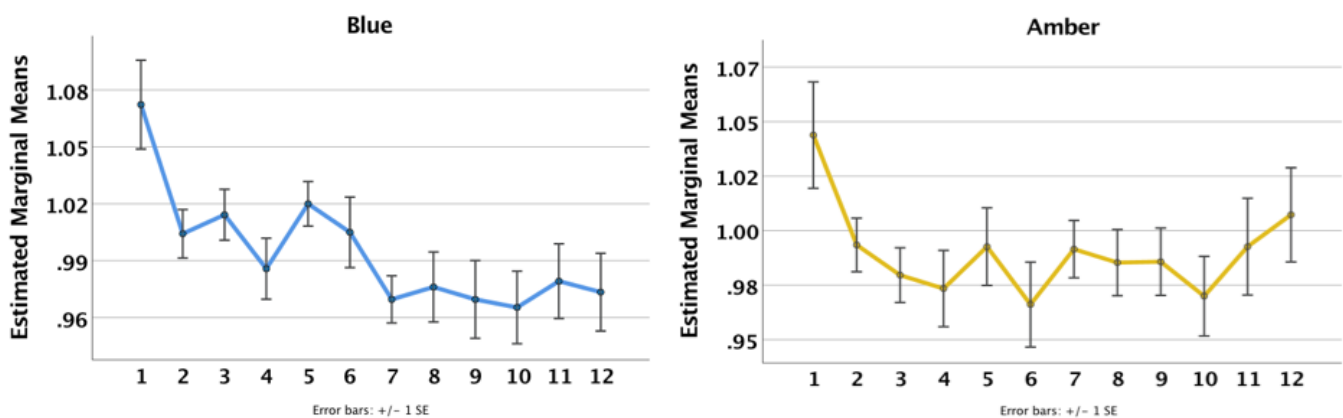


Figure 31. Pupil size normalized to baseline during blue wavelength light exposure (left) and amber placebo wavelength light exposure (right). The graphs show similar trends in reduced pupil size compared to the initial light exposure block 1 and all remaining light exposure blocks 2-12.

Overall Pupil Size: Finally, we conducted a paired samples t-test to compare pupil size in blue wavelength light versus amber placebo wavelength light conditions. As shown in Figure 32, normalized pupil size was similar when exposed to blue wavelength light ($M = .9888, SD = .03$) compared to amber placebo wavelength light ($M = .9883, SD = .02$) ($t(31) = .08, p = .94$).

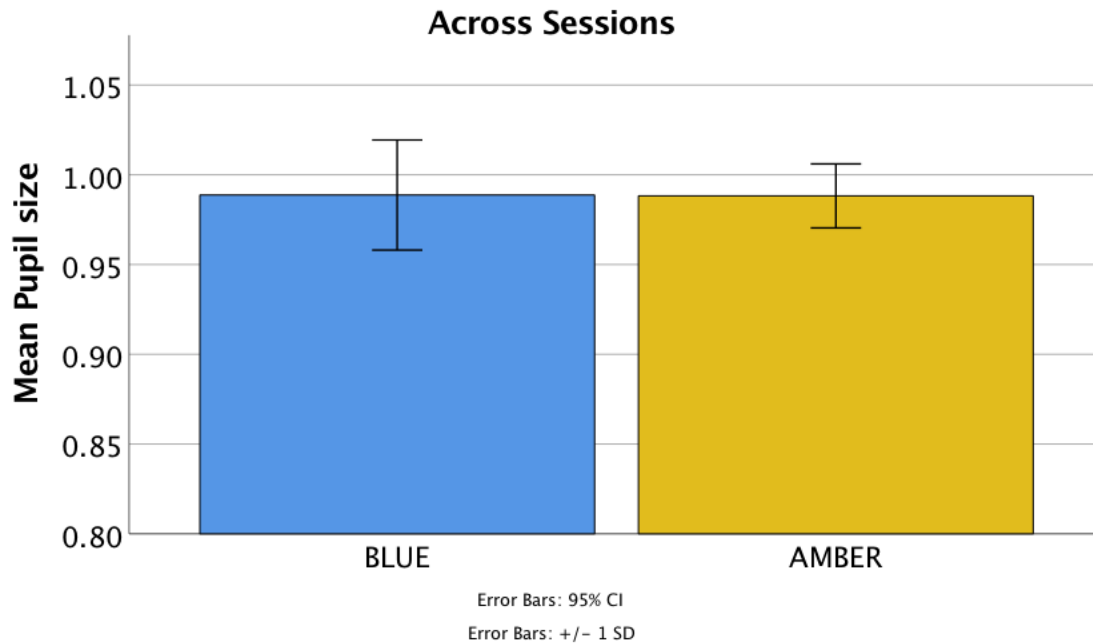


Figure 32. Pupil size normalized to baseline when exposed to blue versus amber placebo wavelength light.

One interpretation of the current findings is that participants exhibited a hyper state of arousal at the onset of the rs-fMRI session, as indexed by the pupil size in block one and then habituated to the task during the 12-minute scan session, as indexed by an overall reduction in pupil size across the remaining light exposure blocks, irrespective of light exposure. Contrary to our hypothesis we did not find evidence of increased norepinephrine during blue wavelength light exposure, as measured by pupil size. It is necessary to note two important limitations when interpreting these findings. First, this study was a small pilot study, and the above findings are based on eye tracking data from a total of 32 subjects. Second, the use of pupil size as an indirect measure of norepinephrine may be too crude a measure, and highly influenced by additional factors, to capture changes in norepinephrine release.

Conclusion: *Overall these preliminary findings suggest that acute exposure to blue light is potentially effective for sustaining or improving neural efficiency. We found that a brief exposure to blue light in the scanner was associated with significantly suppressed deactivation of the default mode network, a brain system that is usually disengaged by difficult cognitive effort. We found this in the context of equivalent performance between the blue and amber conditions, suggesting that blue light allows the individual to sustain equivalent cognitive performance without having to work as hard to accomplish that task. We also found evidence that a brain region proximal to the location of the locus coeruleus (LC) was also more activated by blue light. We hypothesized that this would be associated with increased norepinephrine release, which would be the underlying mechanism to sustain cognitive performance in blue light relative to amber. However, despite evidence of activation of the LC, we did not find clear evidence that blue light increased pupil size during the task. Further research on this issue is needed. However, these findings are promising and suggest that even brief exposures to blue light may provide an important and potentially effective method for sustaining cognitive performance.*

Recruitment:

Recruitment is completed for this study. In total, 155 individuals expressed interest in participating by filling out an online screening/interest form. We enrolled a total of 45 subjects. 4 of these subjects voluntarily withdrew from the study while another 5 were removed at the discretion of study staff either due to safety of the participant or data quality reasons. In total, 36 participants completed both arms of the study, though one participant was removed at their second visit due to the presence of a metal retainer which was against our eligibility criteria and MRI safety protocol.

What opportunities for training and professional development has the project provided?

There were many opportunities for training and professional development throughout the duration of this project. Student research assistants hired for this project were trained in several areas that advanced their professional skills and experience. Specifically, research assistants were trained on multiple neuropsychological assessments used throughout the study, how to collect saliva samples appropriately, how to use eye tracking software, and how to collect and analyze functional neuroimaging data. Research assistants were also given the opportunity to learn proper human subjects management, included but not limited to how to conduct study visits. These professional skills are important in the area of biopsychological research, and will be useful for their academic or clinical careers in the areas of (neuro-)psychology, medicine, or physiology.

How were the results disseminated to communities of interest?

Abstracts have been submitted for presentation at the MHSRS and SLEEP conferences. Publications are currently in preparation.

What do you plan to do during the next reporting period to accomplish the goals?

Nothing to Report.

4. IMPACT:

What was the impact on the development of the principal discipline(s) of the project?

The project has identified potential mechanisms that underlie the acute cognitive effects of blue light exposure. Overall, these preliminary findings suggest that even short durations of blue light exposure can produce significant acute changes within the default mode network (DMN) of the brain and the locus coeruleus (LC), which appear to enhance neural efficiency and cognitive functioning. These preliminary findings will provide a solid foundation for further work to manipulate and control these systems to enhance alertness and cognitive performance in operational environments.

What was the impact on other disciplines?

Nothing to report.

What was the impact on technology transfer?

Nothing to Report.

What was the impact on society beyond science and technology?

Our society is overworked and lacking in sleep. While pharmacologic countermeasures such as caffeine and other stimulants can sustain cognitive performance temporarily, they have their limits and can also lead to adverse health consequences. Therefore, alternative non-pharmacologic methods are critically needed. The findings from this project hold promise facilitate the further development of light interventions to modulate alertness and cognitive performance without drugs. Further work is being planned for identifying the precision elements and inter-individual difference factors involved in responsiveness to blue light. Thus, the present work will have a significant impact on moving the field forward toward rapid development of new light interventions. Further, these findings will soon be published in the peer-reviewed literature, which will allow a broader dissemination of the positive and potentially negative impacts of light exposure and ways to use light to facilitate health.

5. CHANGES/PROBLEMS:

Changes in approach and reasons for change

Study related amendments are listed below in chronological order. Approval data for each amendment is provided, along with a brief description of the reason for changes made to the study.

Amendments

- Amendment #1 (Approved by local IRB: 04 DEC 2019):
 - The amendment proposed the inclusion of instructions to participants to abstain from various data-hindering activities prior to their visits as well as updating the visit location.
- Amendment #2 (Approved by local IRB: 20 APR 2020):
 - The amendment proposed updating the informed consent form to clarify and simplify aspects of the ICF related to data and MRI procedures. The amendment also proposed updating the IRB application by including information regarding the investigation of a device, updating MRI information, editing eligibility, and clarifying procedures. Finally, the amendment proposed edits to subject materials such as emails for clarity, formatting, and to provide additional information.
- Amendment #3 (Approved by local IRB: 10 JUN 2020):
 - The amendment proposed the updating of study documents (emails to participants, informed consent forms, phone scripts, letters to participants) to correct projected duration of visits to account for COVID-19 cleaning protocols, as well as the inclusion of a comprehension questionnaire for a complicated scanner task.
- Amendment #4 (Approved by local IRB: 25 SEP 2020):
 - The amendment added Dr. Killgore as PI while updating Dr. Alkozei's role to Co-I (Dr. Alkozei transferred to a new institution and the project was acquired by Dr. Killgore, who took over the role as PI.
- Amendment #5 (Approved by local IRB: 13 JAN 2021):
 - The amendment proposed the addition of Michael Warren, Taylor Deatrick, Kelsie Westerhaus, and Lynnette Valencia to the List of Research Personnel.

Actual or anticipated problems or delays and actions or plans to resolve them

The project experienced significant delays due to the emergence of the COVID-19 pandemic. Due to the requirements for university closure and government lockdown orders, we were unable to collect data for nearly half the duration of the second reporting year. This impacted our ability to complete the project as originally

planned. However, with the approved no-cost extension we were able to rapidly make up for the delay. In addition, we experienced difficulty accessing the MRI scanner due to reduced availability. All data were collected and have now been analyzed.

Changes that had a significant impact on expenditures

None.

Significant changes in use or care of human subjects, vertebrate animals, biohazards, and/or select agents

None.

Significant changes in use or care of human subjects

With the emergence of the COVID-19 pandemic, we initially had to cease all research operations. Eventually, we were able to return to research activities with significant modification to human contacts. These included requirements for participants to report current health status before being allowed to participate or enter the facility. All participants were screened for temperature prior to entry into the MRI facilities. Additionally, face masks were required for all participants and staff and all were required to maintain 6-feet of social distance at all times, when possible. We also instituted a virtual portal where participant would complete their study questionnaires in a private room over a secured video conference call with a research technician in the next room. We also instituted significant sanitization of all work areas and regular decontamination procedures within the MRI scanner. All staff were required to wear appropriate personal protective equipment when interacting with participants.

Significant changes in use or care of vertebrate animals.

Nothing to report.

Significant changes in use of biohazards and/or select agents

Nothing to report.

6. PRODUCTS:

- **Publications, conference papers, and presentations**

Report only the major publication(s) resulting from the work under this award.

Journal publications.

Nothing to report

Books or other non-periodical, one-time publications.

Nothing to report.

Other publications, conference papers, and presentations. *Identify any other publications, conference papers and/or presentations not reported above. Specify the status of the publication as noted above. List*

presentations made during the last year (international, national, local societies, military meetings, etc.). Use an asterisk () if presentation produced a manuscript.*

Killgore WD, Ralston, KN, King, R, Dailey, NS, & Alkozei, A. Enhancing cognitive brain functions via light stimulation. Abstract submitted to the Military Health Systems Research Symposium, 2021. Kissimmee, FL, August 23-26, 2021.

Lucas, D. & **Killgore, WD**. Brief blue light exposure results in quicker decision time without sacrificing accuracy in a two-armed bandit task. Abstract submitted to the Society of Biological Psychiatry Conference, New Orleans, LA, April 28-30, 2022.

Reign, D., Dailey, N.S., King, R, Grandner, M.A., Alkozei, A., & **Killgore, WD**. Blue light exposure facilitates cortical neural efficiency exclusive of melatonin effects. Abstract submitted for presentation at the Associated Professional Sleep Societies meeting, Charlotte, NC, June 4-8, 2022.

Reign, D., Dailey, N.S., King, R, Grandner, M.A., Alkozei, A., & **Killgore, WD**. Acute blue light exposure increases activation in the pulvinar nucleus. Abstract submitted for presentation at the Associated Professional Sleep Societies meeting, Charlotte, NC, June 4-8, 2022.

- **Website(s) or other Internet site(s)**

Nothing to report.

- **Technologies or techniques**

Nothing to report.

- **Inventions, patent applications, and/or licenses**

Nothing to report.

- **Other Products**

Nothing to report.

7. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS

What individuals have worked on the project?

Name:	William D.S. Killgore, Ph.D.
Project Role:	Principal Investigator
Researcher Identifier:	n/a

Contribution to Project:	Dr. Killgore provided intellectual and study design expertise to this project as well as on-site supervision of progress.
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Name:	Anna Alkozei, Ph.D.
Project Role:	Co-Investigator
Researcher Identifier:	n/a

Contribution to Project:	Dr. Alkozei oversaw all aspects of project progress remotely.
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Name: Rylee King, B.S.
Project Role: Research Technician
Researcher Identifier: n/a

Contribution to Project: Ms. King provided support with recruitment activities, data collection and data storage.

Name: Delaney Jecmen
Project Role: Student Worker
Researcher Identifier: n/a

Contribution to Project: Ms. Jecmen provided support with recruitment activities, data collection and data storage.

Name: Daniel Lucas
Project Role: Student Worker
Researcher Identifier: n/a

Contribution to Project: Mr. Lucas provided support with recruitment activities, data collection and data storage.

Has there been a change in the active other support of the PD/PI(s) or senior/key personnel since the last reporting period?

Nothing to report.

What other organizations were involved as partners?

Nothing to report

8. SPECIAL REPORTING REQUIREMENTS

COLLABORATIVE AWARDS:

QUAD CHARTS:

9. APPENDICES:

APPENDICES

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List of Assessments and Computer-Administered Tasks

Beck Anxiety Inventory (BAI)

Beck Depression Inventory (BDI-II)

Day of Scan Information Questionnaire Visit 1 (DSIQ-V1)

Day of Scan Information Questionnaire Visit 2 (DSIQ-V2)

Emotional Reward Task

Emotional Reward Task Check

Gratitude Resentment and Appreciation Test – Revised (GRAT-R)

Karolinska Sleepiness Scale (KSS)

NBack Task

Positive and Negative Affect Schedule (PANAS)

Pittsburgh Sleep Quality Index (PSQI)

Raven's Progressive Matrices

Sleep Diary

State-Trait Anxiety Inventory (STAI)

Sleep Quality Scale (SQS)

Social Support Questionnaire (SSQ)

Beck Anxiety Inventory

Below is a list of common symptoms of anxiety. Please carefully read each item in the list. Indicate how much you have been bothered by that symptom during the past month, including today, by circling the number in the corresponding space in the column next to each symptom.

	Not At All	Mildly but it didn't bother me much.	Moderately - it wasn't pleasant at times	Severely – it bothered me a lot
Numbness or tingling	0	1	2	3
Feeling hot	0	1	2	3
Wobbliness in legs	0	1	2	3
Unable to relax	0	1	2	3
Fear of worst happening	0	1	2	3
Dizzy or lightheaded	0	1	2	3
Heart pounding/racing	0	1	2	3
Unsteady	0	1	2	3
Terrified or afraid	0	1	2	3
Nervous	0	1	2	3
Feeling of choking	0	1	2	3
Hands trembling	0	1	2	3
Shaky / unsteady	0	1	2	3
Fear of losing control	0	1	2	3
Difficulty in breathing	0	1	2	3
Fear of dying	0	1	2	3
Scared	0	1	2	3
Indigestion	0	1	2	3
Faint / lightheaded	0	1	2	3
Face flushed	0	1	2	3
Hot/cold sweats	0	1	2	3
Column Sum				

Scoring - Sum each column. Then sum the column totals to achieve a grand score. Write that score here _____ .

Interpretation

A grand sum between **0 – 21** indicates very low anxiety. That is usually a good thing. However, it is possible that you might be unrealistic in either your assessment which would be denial or that you have learned to “mask” the symptoms commonly associated with anxiety. Too little “anxiety” could indicate that you are detached from yourself, others, or your environment.

A grand sum between **22 – 35** indicates moderate anxiety. Your body is trying to tell you something. Look for patterns as to when and why you experience the symptoms described above. For example, if it occurs prior to public speaking and your job requires a lot of presentations you may want to find ways to calm yourself before speaking or let others do some of the presentations. You may have some conflict issues that need to be resolved. Clearly, it is not “panic” time but you want to find ways to manage the stress you feel.

A grand sum that **exceeds 36** is a potential cause for concern. Again, look for patterns or times when you tend to feel the symptoms you have circled. Persistent and high anxiety is not a sign of personal weakness or failure. It is, however, something that needs to be proactively treated or there could be significant impacts to you mentally and physically. You may want to consult a counselor if the feelings persist.

Subject ID: _____ Marital Status: _____ Age: _____ Sex: _____

Occupation: _____ Education: _____

Instructions: This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out the **one statement** in each group that best describes the way you have been feeling during the **past two weeks, including today**. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group. Be sure that you do not choose more than one statement for any group, including Item 16 (Changes in Sleeping Pattern) or Item 18 (Changes in Appetite).

1. Sadness

- 0 I do not feel sad.
- 1 I feel sad much of the time.
- 2 I am sad all the time.
- 3 I am so sad or unhappy that I can't stand it.

2. Pessimism

- 0 I am not discouraged about my future.
- 1 I feel more discouraged about my future than I used to be.
- 2 I do not expect things to work out for me.
- 3 I feel my future is hopeless and will only get worse.

3. Past Failure

- 0 I do not feel like a failure.
- 1 I have failed more than I should have.
- 2 As I look back, I see a lot of failures.
- 3 I feel I am a total failure as a person.

4. Loss of Pleasure

- 0 I get as much pleasure as I ever did from the things I enjoy.
- 1 I don't enjoy things as much as I used to.
- 2 I get very little pleasure from the things I used to enjoy.
- 3 I can't get any pleasure from the things I used to enjoy.

5. Guilty Feelings

- 0 I don't feel particularly guilty.
- 1 I feel guilty over many things I have done or should have done.
- 2 I feel quite guilty most of the time.
- 3 I feel guilty all of the time.

6. Punishment Feelings

- 0 I don't feel I am being punished.
- 1 I feel I may be punished.
- 2 I expect to be punished.
- 3 I feel I am being punished.

7. Self-Dislike

- 0 I feel the same about myself as ever.
- 1 I have lost confidence in myself.
- 2 I am disappointed in myself.
- 3 I dislike myself.

8. Self-Criticalness

- 0 I don't criticize or blame myself more than usual.
- 1 I am more critical of myself than I used to be.
- 2 I criticize myself for all of my faults.
- 3 I blame myself for everything bad that happens.

9. Suicidal Thoughts or Wishes

- 0 I don't have any thoughts of killing myself.
- 1 I have thoughts of killing myself, but I would not carry them out.
- 2 I would like to kill myself.
- 3 I would kill myself if I had the chance.

10. Crying

- 0 I don't cry any more than I used to.
- 1 I cry more than I used to.
- 2 I cry over every little thing.
- 3 I feel like crying, but I can't.

Subtotal Page 1

Continued on Back

11. Agitation

- 0 I am no more restless or wound up than usual.
- 1 I feel more restless or wound up than usual.
- 2 I am so restless or agitated that it's hard to stay still.
- 3 I am so restless or agitated that I have to keep moving or doing something.

12. Loss of Interest

- 0 I have not lost interest in other people or activities.
- 1 I am less interested in other people or things than before.
- 2 I have lost most of my interest in other people or things.
- 3 It's hard to get interested in anything.

13. Indecisiveness

- 0 I make decisions about as well as ever.
- 1 I find it more difficult to make decisions than usual.
- 2 I have much greater difficulty in making decisions than I used to.
- 3 I have trouble making any decisions.

14. Worthlessness

- 0 I do not feel I am worthless.
- 1 I don't consider myself as worthwhile and useful as I used to.
- 2 I feel more worthless as compared to other people.
- 3 I feel utterly worthless.

15. Loss of Energy

- 0 I have as much energy as ever.
- 1 I have less energy than I used to have.
- 2 I don't have enough energy to do very much.
- 3 I don't have enough energy to do anything.

16. Changes in Sleeping Pattern

- 0 I have not experienced any change in my sleeping pattern.
- 1a I sleep somewhat more than usual.
- 1b I sleep somewhat less than usual.
- 2a I sleep a lot more than usual.
- 2b I sleep a lot less than usual.
- 3a I sleep most of the day.
- 3b I wake up 1-2 hours early and can't get back to sleep.

17. Irritability

- 0 I am no more irritable than usual.
- 1 I am more irritable than usual.
- 2 I am much more irritable than usual.
- 3 I am irritable all the time.

18. Changes in Appetite

- 0 I have not experienced any change in my appetite.
- 1a My appetite is somewhat less than usual.
- 1b My appetite is somewhat greater than usual.
- 2a My appetite is much less than before.
- 2b My appetite is much greater than usual.
- 3a I have no appetite at all.
- 3b I crave food all the time.

19. Concentration Difficulty

- 0 I can concentrate as well as ever.
- 1 I can't concentrate as well as usual.
- 2 It's hard to keep my mind on anything for very long.
- 3 I find I can't concentrate on anything.

20. Tiredness or Fatigue

- 0 I am no more tired or fatigued than usual.
- 1 I get more tired or fatigued more easily than usual.
- 2 I am too tired or fatigued to do a lot of the things I used to do.
- 3 I am too tired or fatigued to do most of the things I used to do.

21. Loss of Interest in Sex

- 0 I have not noticed any recent change in my interest in sex.
- 1 I am less interested in sex than I used to be.
- 2 I am much less interested in sex now.
- 3 I have lost interest in sex completely.

DSIQ- V1

Day of Scan Information Questionnaire (DSIQ)

Date _____

Date of Birth _____
(in M-D-Y format)

Height _____
(Inches (4 feet = 48 inches, 5 feet = 60 inches, 6 feet = 72 inches))

Weight _____
(Pounds)

Sex

- ☐ Male
☐ Female

What is the highest grade or level of school that you have completed or the highest degree you have obtained?

- ☐ Less than 9th grade
☐ Some high school, no diploma
☐ High school graduate, or equivalent
☐ Some college, no degree
☐ Technical/Vocational degree
☐ Associate degree
☐ Bachelor's degree
☐ Master's degree
☐ Doctorate degree

With what ethnicity do you identify?

- ☐ White
☐ Hispanic/Latino
☐ Black/African-American
☐ Native-American/American Indian
☐ Asian/Pacific Islander
☐ Other

What is your eye color?

- ☐ Blue
☐ Brown
☐ Hazel
☐ Green
☐ Other: _____

Caffeine Use

Did you have any caffeine containing products today?

☐ Yes ☐ No

How many?

On average, how many cups of caffeinated coffee do you drink per day?

On average, how many cups of caffeinated tea do you drink per day?

On average, how many bottles/cans of caffeinated soda do you drink per day?

On average, how many energy drinks do you drink per day?

What brand(s) do you drink?

Do you use any other caffeinated products, such as Vivarin or NoDoz? ☐ Yes ☐ No

What product(s)?

How much?

((Designate mode of consumption in the next question))

Mode of consumption

((e.g. tablets))

How often?

☐ Day ☐ Week ☐ Month

☐

☐

Nicotine Use

Did you consume any nicotine products in the 12 hours prior to your visit?

☐ Yes ☐ No

Do you smoke cigarettes? ☐ Yes ☐ No

About how many cigarettes do you smoke per day?

How long have you been smoking?

(Years)

Have you tried to quit? ☐ Yes ☐ No

How many times?

Did you ever smoke cigarettes in the past? ☐ Yes ☐ No

How many cigarettes did you smoke per day?

How many years ago did you start smoking?

How many years ago did you quit?

Do you use smokeless tobacco, such as dip or chew? ☐ Yes ☐ No

About how much do you use per day?

((Designate mode of consumption in the next question))

Mode of consumption

((e.g. pouches))

Did you ever use smokeless tobacco in the past, but have since stopped?

☐ Yes ☐ No

How much did you use per day?

((Designate mode of consumption in the next question))

Mode of consumption

((e.g. pouches))

How many years ago did you start using smokeless tobacco?

How many years ago did you quit?

Do you use any other nicotine-containing products?

☐ Yes ☐ No

What product(s)?

How much?

((Designate mode of consumption in the next question))

Mode of consumption

((e.g. lozenges))

How often?

☐ Day ☐ Week ☐ Month

☐

☐

Other

Do you take diet pills?

☐ Yes ☐ No

What brand(s)?

How many?

How often?

☐ Day ☐ Week ☐ Month

☐

Did you consume any temporary medications such as Ibuprofen, Tylenol, Excedrin, or other types of over-the-counter medications 12 hours prior to your visit?

☐ Yes ☐ No

Are you currently taking any medications, vitamins, or supplements?

☐ Yes ☐ No

List medication

((e.g. Ibuprofen, 200 mg, Daily))

List all medications and dosages.

Did you consume any alcohol in the 12 hours prior to your visit?

☐ Yes ☐ No

How many times per month do you drink (alcohol)?

On those occasions, what is the average number of drinks you consume?

On those occasions, what is the largest number of drinks you consume?

How many times in the past year have you used marijuana?

Have you ever used marijuana at other times in your life? ☐ Yes ☐ No

At what age did you begin smoking marijuana?

On approximately how many occasions have you used marijuana?

When hungry, how much do you crave sweets?

Do you use any other street drugs currently or in the past year? ☐ Yes ☐ No

Which drug(s)?

How much?

((Designate mode of consumption in the next question))

Mode of consumption

((e.g. pills))

How often?

☐ Day ☐ Week ☐ Month

☐

☐

Physical Information

When was your last menstrual period (be as precise as possible)?

(Date of period: _____ or about _____ days ago)

Did you consume any pitted fruit, bananas or chocolate in the 24 hours prior to your visit?

Yes ☐ No ☐

Thinking about the past four weeks, on average, how many meals do you have per day?

1

2

3

4

5+

Thinking about the past four weeks, on average, how many times do you snack per day?

1

2

3

4

5+

How has your appetite been over the past four weeks on average?

1 Little to no appetite (feeling full/ satisfied most of the time)

2

3

4

5

6

7

8

9

10 Increased appetite (feeling hungry most of the time)

When hungry, how much do you crave sweets?

Do you feel that you eat more than you intend to?

Yes

No

When hungry, how much do you crave carbohydrates (e.g. rice, breads, pastas)?

1 Never

2

3

4

5

6

7

8

9

10 Always

When hungry, how much do you crave fats (e.g. fried food, red meats, cheese/cream, chips)?

1 Never

2

3

4

5

6

7

8

9

10 Always

When hungry, how much do you crave sweets?

1 Never

2

3

4

5

6

7

8

9

10 Always

Do you engage in regular exercise? ☐ Yes ☐ No

Thinking about the past four weeks, on average, how many days per week do you exercise?

- ☐ 1
☐ 2
☐ 3
☐ 4
☐ 5
☐ 6
☐ 7

Thinking about the past four weeks, on average, how many minutes is each exercise session?

(Minutes)

What percent of your exercise is cardio?

(Percent (%))

What percent of your exercise is strength training?

(Percent (%))

What percent of your exercise is light exercise (e.g. stretching, walking, and some types of yoga)?

(Percent (%))

Sleep Habits

How many hours of sleep did you get last night?

((e.g. 7.5 for 7 hours 30 minutes of sleep))

Keeping the past four weeks in mind, how many hours do you typically sleep on weeknights (Sun-Thurs)?

Keeping the past four weeks in mind, how many hours do you typically sleep on weekend nights (Fri-Sat)?

Keeping the past four weeks in mind, at what time do you normally go to bed at night on weeknights (Sun-Thurs)?

(In standard time HH:MM)

AM or PM?

- ☐ AM
☐ PM

Keeping the past four weeks in mind, at what time do you normally go to bed at night on weekends (Fri-Sat)?

(In standard time HH:MM)

AM or PM?

- ☐ AM
☐ PM

Keeping the past four weeks in mind, at what time do you typically awaken on weekdays (Mon-Fri)?

(In standard time HH:MM) AM or PM?

☐ AM ☐ PM

Keeping the past four weeks in mind, at what time do you typically awaken on weekends (Sat-Sun)?

(In standard time HH:MM)

AM or PM?

☐ AM

☐ PM

Keeping the past four weeks in mind, how many minutes does it typically take to fall asleep at night on weeknights (Sun-Thurs)?

((e.g. 15 for 15 minutes))

Keeping the past four weeks in mind, how many minutes does it typically take you to fall asleep at night on weekends (Fri-Sat)?

At what time of day do you feel sleepiest?

(In standard time HH:MM)

AM or PM?

☐ AM

☐ PM

At what time of day do you feel most alert?

(In standard time HH:MM)

AM or PM?

☐ AM ☐ PM

How many hours do you need to sleep per night to feel your best?

"If I get less than ____ hours of sleep, I notice an impairment in my ability to function at work."

"If I get more than ____ hours of sleep, I notice an impairment in my ability to function at work."

Is daytime sleepiness currently a problem for you? ☐ Yes ☐ No

Are you currently doing shift work, that is, working early morning, evening, or night shifts?

☐ Yes ☐ No

Do you ever have trouble falling asleep?

☐ Yes ☐ No

How often per week, month, or year?

((Designate time period in the next question))

Specify time period

☐ Week
☐ Month
☐ Year

Do you ever have trouble staying asleep? ☐ Yes ☐ No

How often per week, month, or year?

((Designate time period in the next question))

Specify time period ☐ Week

☐ Month

☐ Year

☐

Do you take more than two daytime naps per month? ☐ Yes ☐ No

About how many times per week do you nap?

At what time of day do you normally begin your nap?

(HH:MM)

AM or PM?

☐

AM PM

☐

At what time of day do you normally wake up from your nap?

(HH:MM)

AM or PM?

☐

AM PM

☐

☐ Light ☐ Normal ☐ Heavy

☐

☒ Yawn often

☐ 1 (Never) ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 (Always yawning) When I see or hear

someone else yawn, I will yawn too

☐ 1 (Never)

☐ 2

☐ 3

☐ 4

☐ 5

☐

☐

6
Do you consider yourself a light, normal, or heavy sleeper?
8
9
10 (Every time)

Tell your study administrator when you have reached the end. Do not continue until you are told to do so.

Day of Scan Information Questionnaire (DSIQ)

Date

Caffeine Use

Did you have any caffeine containing products today? ☐ Yes ☐ No

How many?

During the past week, on average, how many cups of caffeinated coffee do you drink per day?

During the past week, on average, how many cups of caffeinated tea do you drink per day?

During the past week, on average, how many bottles/cans of caffeinated soda do you drink per day?

During the past week, on average, how many energy drinks do you drink per day?

What brand(s) do you drink?

During the past week, did you use any other caffeinated products, such as Vivarin or NoDoz? ☐ Yes ☐ No

What product(s)?

How much?

((Designate mode of consumption in the next question))

Mode of consumption

((e.g. tablets))

How often?

☐ Day ☐ Week ☐ Month

☐

Did you consume any temporary medications such as Ibuprofen, Tylenol, Excedrin, or other types of over-the-counter medications 12 hours prior to your visit?

☐ Yes ☐ No

Nicotine Use

Did you consume any nicotine products in the 12 hours prior to your visit?

☐ Yes ☐ No

During the past week, did you smoke cigarettes? ☐ Yes ☐ No

About how many cigarettes did you smoke per day?

During the past week, did you use smokeless tobacco, such as dip or chew?

☐ Yes ☐ No

About how much do you use per day?

((Designate mode of consumption in the next question))

Mode of consumption

((e.g. pouches))

Did you ever use smokeless tobacco in the past, but have since stopped?

☐ Yes ☐ No

How much did you use per day?

((Designate mode of consumption in the next question))

Mode of consumption

((e.g. pouches))

During the past week, did you use any other nicotine-containing products? ☐ Yes ☐ No

What product(s)?

How much?

((Designate mode of consumption in the next question))

Mode of consumption

((e.g. lozenges))

Other

During the past week, did you take diet pills?

☐ Yes ☐ No

What brand(s)?

How many?

Did you consume any temporary medications such as Ibuprofen, Tylenol, Excedrin, or other types of over-the-counter medications 12 hours prior to your visit?

☐ Yes ☐ No

Did you consume any alcohol in the 12 hours prior to your visit?

☐ Yes ☐ No

How many times in the past week did you drink (alcohol)?

On those occasions, what is the average number of drinks you consumed?

On those occasions, what is the largest number of drinks you consumed?

How many times in the past week have you used marijuana?

Physical Information

When was your last menstrual period (be as precise as possible)?

(Date of period: _____ or about _____ days ago)

Did you consume any pitted fruit, bananas or chocolate in the 24 hours prior to your visit?

☐ Yes ☐ No

Thinking about the past week, on average, how many meals did you have per day?

1
2
3
4

5+

Thinking about the past week, on average, how many times did you snack per day?

- 1
- 2
- 3
- 4
- 5+

How has your appetite been over the past week on average?

- 1 Little to no appetite (feeling full/ satisfied most of the time)
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10 Increased appetite (feeling hungry most of the time)

In the past week, did you engage in regular exercise?

- ☐ Yes ☐ No

Keeping the past four weeks in mind, at what time do you typically awaken on weekdays (Mon-Fri)?

- ☐ 1
☐ 2
☐ 3
☐ 4
☐ 5
☐ 6
☐ 7

Thinking about the past f week, on average, how many minutes is each exercise session?

(Minutes)

What percent of your exercise is cardio?

(Percent (%))

What percent of your exercise is strength training?

(Percent (%))

What percent of your exercise is light exercise (e.g. stretching, walking, and some types of yoga)?

(Percent (%))

Sleep Habits

How many hours of sleep did you get last night?

((e.g. 7.5 for 7 hours 30 minutes of sleep))

During the past week, was daytime sleepiness a problem for you? ☐ Yes ☐ No

☐ Yes ☐ No

During the psat week, did you ever have trouble falling asleep?

☐ Yes ☐ No

How many times?

Tell your study administrator when you have reached the end. Do not continue until you are told to do so.

Emotional Reward task

Each of the below slot machines are unique and different from each other.

For each trial, you can choose one slot machine.



Each time you select a slot machine, it will return with one of these three possible outcomes:

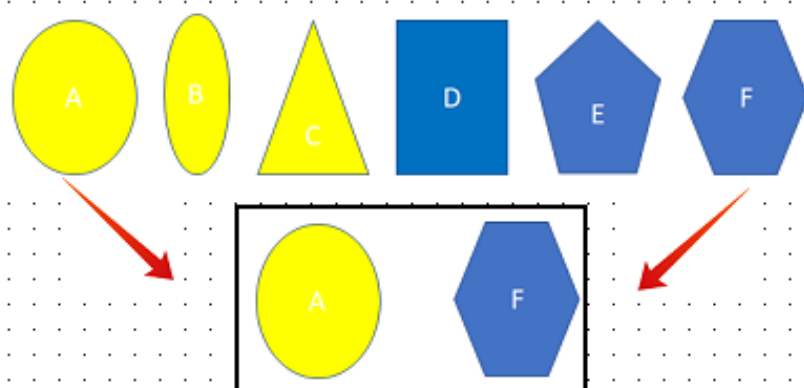
Win 1
dollar

Lose 1
dollar

No change

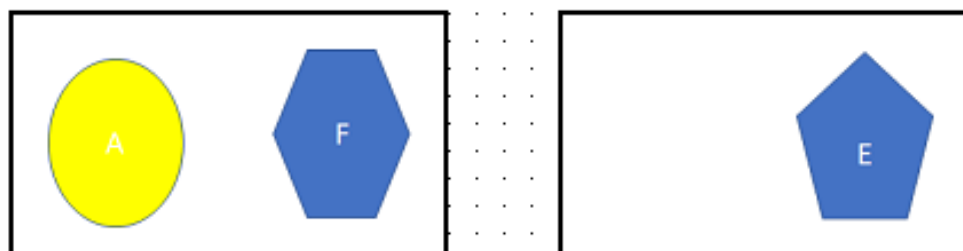
You will play with all 6 different machines throughout the game, but only with a maximum of 2 at one time.

The game will randomly select 2 machines for you to play with at a time, and you will be able to select from these two machines which to play.



You will usually be presented with two machines to choose between.

Sometimes, you will only be presented with one machine.



The experiment is going to start shortly. Before that, please take a few more minutes to answer the following questions, just to check that the rules are clear.

All clarifying questions are most welcome at this stage!

1. The possible outcomes of selecting a particular machine are to either win \$1 or lose \$1.
 - a. True
 - b. False
2. A machine that causes you to win \$1 most of the time is considered “good”.
 - a. True
 - b. False
3. A machine that rarely causes you to lose \$1 is considered “bad”.
 - a. True
 - b. False
4. A “good” machine may suddenly change to be a “bad” machine at any given time.
 - a. True
 - b. False
5. Sudden changes in outcome do not occur at the same time for all machines of the same color.
 - a. True
 - b. False
6. Changes in outcome occur independently for blue machines and yellow machines.
 - a. True
 - b. False
7. Yellow machines change outcome more frequently than blue machines.
 - a. True
 - b. False
8. For each color, the three machines have different levels of “predictability”.
 - a. True
 - b. False
9. A machine is considered “very predictable” if it gives you one of the three outcomes most of the time.
 - a. True
 - b. False
10. A machine is considered “very unpredictable” if all three outcomes are equally possible.
 - a. True
 - b. False
11. If you are only presented with one machine, you do not have to choose anything.
 - a. True
 - b. False
12. There is no penalty for not selecting any machine.
 - a. True
 - b. False

Scoring: If the participant does not get 100% of the questions correct, the instructions for the task will be repeated.

Answer Key:

1. F
2. T
3. F
4. T
5. F
6. T
7. T
8. T
9. T
10. T
11. F
12. F

Participant ID _____

Date _____

GRAT -R

Please provide your honest feelings and beliefs about the following statements which relate to you. There are no right or wrong answers to these statements. We would like to know how much you feel these statements are true or not true of you. Please try to indicate your true feelings and beliefs, as opposed to what you would like to believe. Respond to the following statements by filling in the number that best represents your real feelings in the blank provided next to each statement. Please use the scale provided below, and please choose one number for each statement (i.e. don't circle the space between two numbers).

1	2	3	4	5	6	7	8	9
I strongly disagree		I disagree somewhat		I feel neutral about the statement		I mostly agree with the statement		I strongly agree with the statement

1. ____ I couldn't have gotten where I am today without the help of many people.
2. ____ I think that life has been unfair to me.
3. ____ It sure seems like others get a lot more benefits in life than I do.
4. ____ I never seem to get the breaks or chances that other people do.
5. ____ Often I'm just amazed at how beautiful the sunsets are.
6. ____ Life has been good to me.
7. ____ There never seems to be enough to go around and I never seem to get my share.
8. ____ Often I think, "What a privilege it is to be alive."
9. ____ Oftentimes I have been overwhelmed at the beauty of nature.
10. ____ I feel grateful for the education I have received.
11. ____ Many people have given me valuable wisdom throughout my life that has been important to my success.
12. ____ It seems like people have frequently tried to impede my progress.
13. ____ Although I think it's important to feel good about your accomplishments, I think that it's also important to remember how others have contributed to my success.
14. ____ I really don't think that I've gotten all the good things that I deserve in life.
15. ____ Every Fall I really enjoy watching the leaves change colors.
16. ____ Although I'm basically in control of my life, I can't help but think about all those who have supported me and helped me along the way.
17. ____ Part of really enjoying something good is being thankful for that thing.
18. ____ Sometimes I find myself overwhelmed by the beauty of a musical piece.
19. ____ I'm basically very thankful for the parenting that was provided to me.
20. ____ I've gotten where I am today because of my own hard work, despite the lack of any help or support.
21. ____ Over the December holidays, the presents I get aren't as good or as many as others seem to get.
22. ____ Sometimes I think, "Why am I so fortunate so as to be born into the family and culture I was born into?"
23. ____ One of my favorite times of the year is Thanksgiving.
24. ____ I believe that I am a very fortunate person.
25. ____ I think that it's important to "Stop and smell the roses."
26. ____ More bad things have happened to me in my life than I deserve.
27. ____ I really enjoy the changing seasons.

28. ____ Because of what I've gone through in my life, I really feel like the world owes me something.
29. ____ I believe that the things in life that are really enjoyable are just as available to me as they are to the very rich.
30. ____ I love to sit and watch the snow fall.
31. ____ I believe that I've had more than my share of bad things come my way.
32. ____ Although I think that I'm morally better than most, I haven't gotten my just reward in life.
33. ____ After eating I often pause and think, "What a wonderful meal."
34. ____ Every spring, I really enjoy seeing the flowers bloom.
35. ____ I think that it's important to pause often to "count my blessings."
36. ____ I think it's important to enjoy the simple things in life.
37. ____ I basically feel like life has ripped me off.
38. ____ I feel deeply appreciative for the things others have done for me in my life.
39. ____ I feel that God, or fate, or destiny, doesn't like me very well.
40. ____ The simple pleasures of life are the best pleasures of life.
41. ____ I love the green of spring.
42. ____ For some reason I never seem to get the advantages that others get.
43. ____ I think it's important to appreciate each day that you are alive.
44. ____ I'm really thankful for friends and family.

KAROLINSKA SLEEPINESS SCALE

Please, indicate your sleepiness during the 5 minutes before this rating through circling the appropriate description

1=extremely alert

2=very alert

3=alert

4=rather alert

5=neither alert nor sleepy

6=some signs of sleepiness

7=sleepy, but no effort to keep awake

8=sleepy, some effort to keep awake

9=very sleepy, great effort to keep awake,
fighting sleep

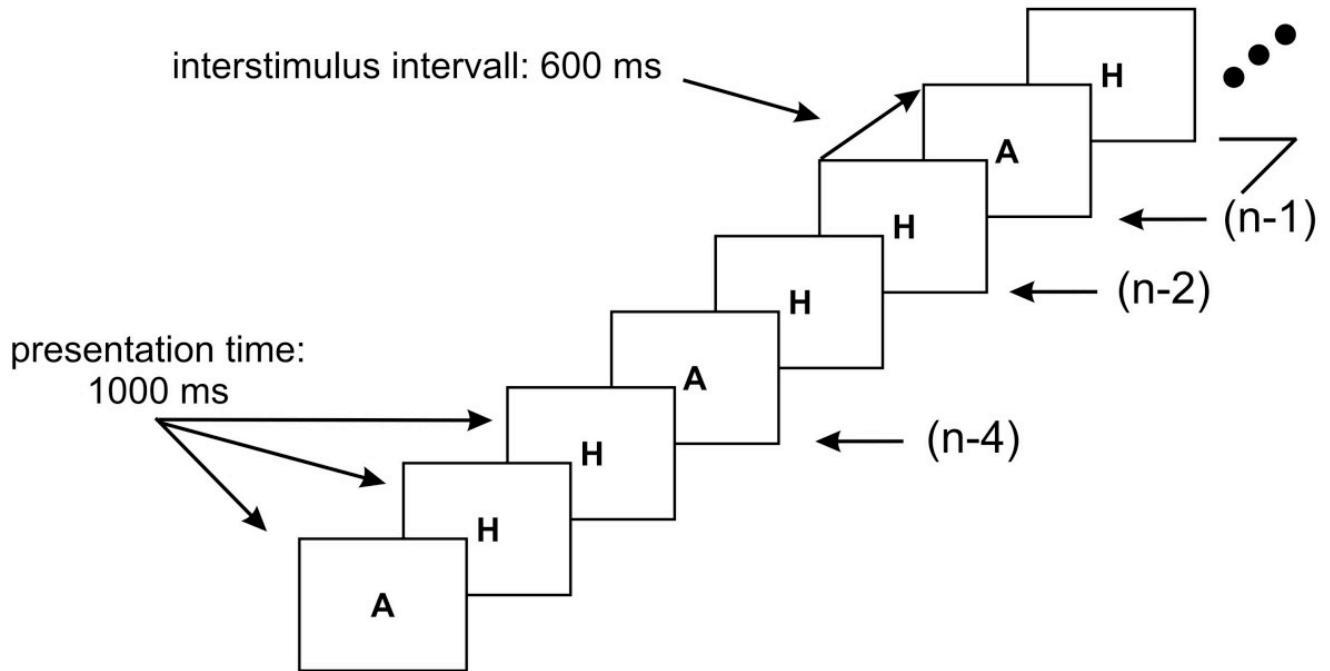
If used electronically, please make sure that the wording of the scale is presented at each rating for easy reference

References

Original study: Åkerstedt, T. and Gillberg, M. Subjective and objective sleepiness in the active individual. *International Journal of Neuroscience*, 1990, 52: 29-37.

Recent review: Åkerstedt, T., Anund, A., Axelsson, J. and Kecklund, G. Subjective sleepiness is a sensitive indicator of insufficient sleep and impaired waking function. *Journal of Sleep Research*, 2014, 23: 240-52.

N-back task



PANAS

Subject: _____ Date: _____ Time: _____

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way RIGHT NOW, that is, at the present moment.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

_____ interested	_____ irritable
_____ distressed	_____ alert
_____ excited	_____ ashamed
_____ upset	_____ inspired
_____ strong	_____ nervous
_____ guilty	_____ determined
_____ scared	_____ attentive
_____ hostile	_____ jittery
_____ enthusiastic	_____ active
_____ proud	_____ afraid

Session _____ ID# _____ Date _____ Time _____ AM
PM

PITTSBURGH SLEEP QUALITY INDEX

INSTRUCTIONS:

The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

1. During the past month, what time have you usually gone to bed at night?

BED TIME _____

2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?

NUMBER OF MINUTES _____

3. During the past month, what time have you usually gotten up in the morning?

GETTING UP TIME _____

4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)

HOURS OF SLEEP PER NIGHT _____

For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you . . .

- a) Cannot get to sleep within 30 minutes

Not during the past month _____	Less than once a week _____	Once or twice a week _____	Three or more times a week _____
------------------------------------	--------------------------------	-------------------------------	-------------------------------------

- b) Wake up in the middle of the night or early morning

Not during the past month _____	Less than once a week _____	Once or twice a week _____	Three or more times a week _____
------------------------------------	--------------------------------	-------------------------------	-------------------------------------

- c) Have to get up to use the bathroom

Not during the past month _____	Less than once a week _____	Once or twice a week _____	Three or more times a week _____
------------------------------------	--------------------------------	-------------------------------	-------------------------------------

d) Cannot breathe comfortably

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____
-----------------------------------	-------------------------------	------------------------------	------------------------------------

e) Cough or snore loudly

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____
-----------------------------------	-------------------------------	------------------------------	------------------------------------

f) Feel too cold

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____
-----------------------------------	-------------------------------	------------------------------	------------------------------------

g) Feel too hot

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____
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h) Had bad dreams

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____
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i) Have pain

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____
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j) Other reason(s), please describe_____

How often during the past month have you had trouble sleeping because of this?

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____
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6. During the past month, how would you rate your sleep quality overall?

Very good _____

Fairly good _____

Fairly bad _____

Very bad _____

7. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____
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8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____
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9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

No problem at all	_____
Only a very slight problem	_____
Somewhat of a problem	_____
A very big problem	_____

10. Do you have a bed partner or room mate?

No bed partner or room mate	_____
Partner/room mate in other room	_____
Partner in same room, but not same bed	_____
Partner in same bed	_____

If you have a room mate or bed partner, ask him/her how often in the past month you have had . . .

- a) Loud snoring

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____
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- b) Long pauses between breaths while asleep

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____
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- c) Legs twitching or jerking while you sleep

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____
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d) Episodes of disorientation or confusion during sleep

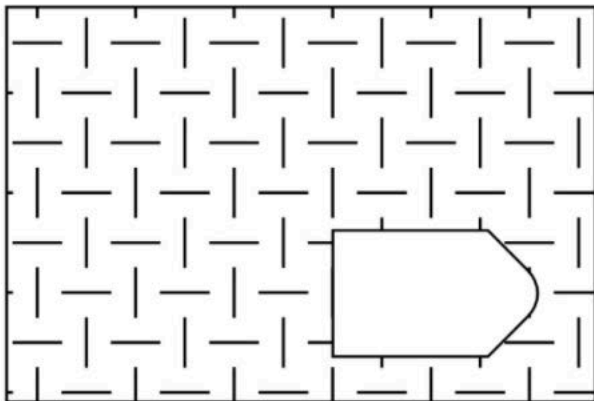
Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____
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e) Other restlessness while you sleep; please describe_____

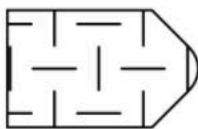
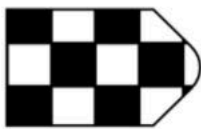
Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____
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Raven's Progressive Matrices test

Question 1 of 24

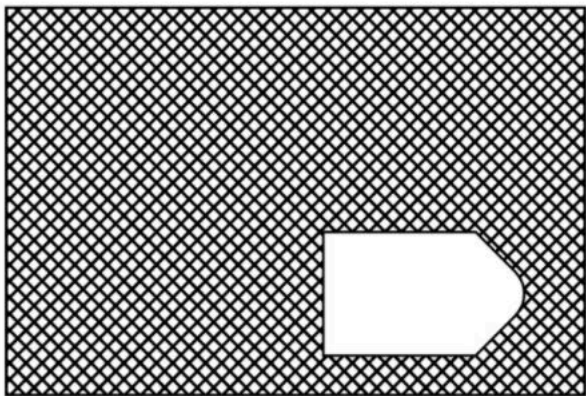


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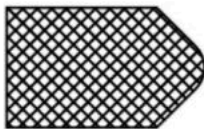


Raven's Progressive Matrices test

Question 2 of 24

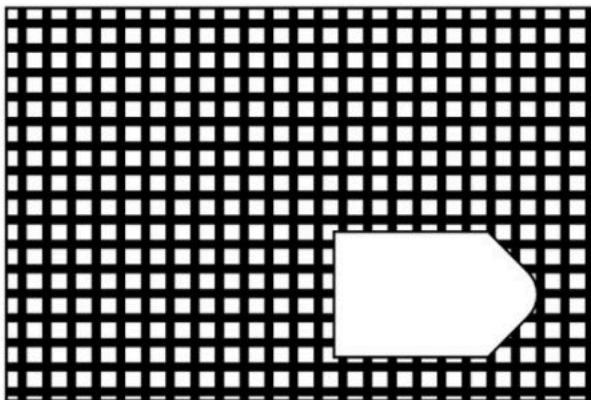


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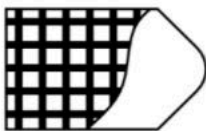
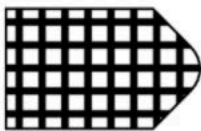


Raven's Progressive Matrices test

Question 3 of 24

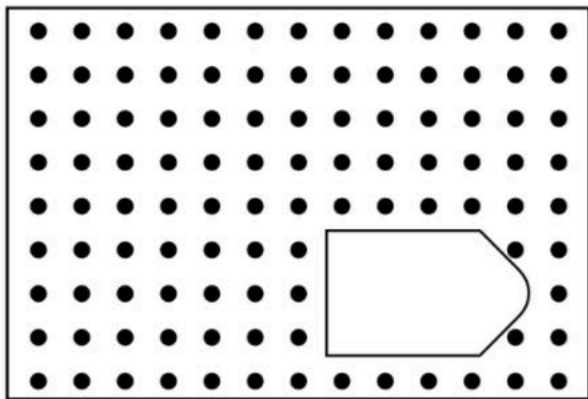


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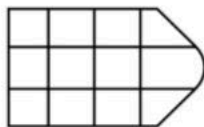
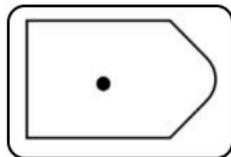
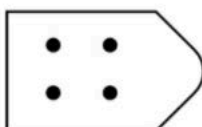
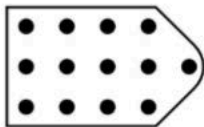
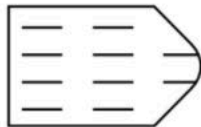


Raven's Progressive Matrices test

Question 4 of 24

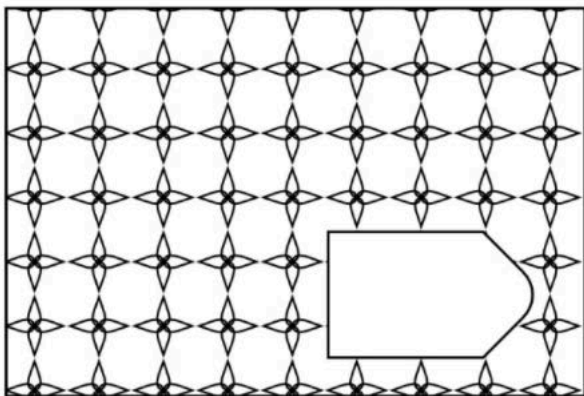


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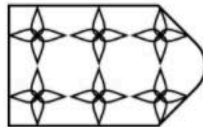
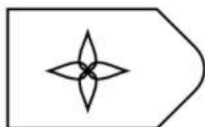
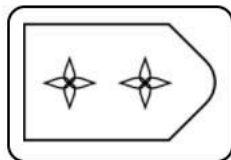
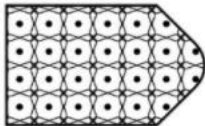
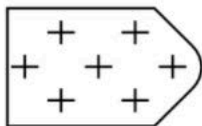


Raven's Progressive Matrices test

Question 5 of 24

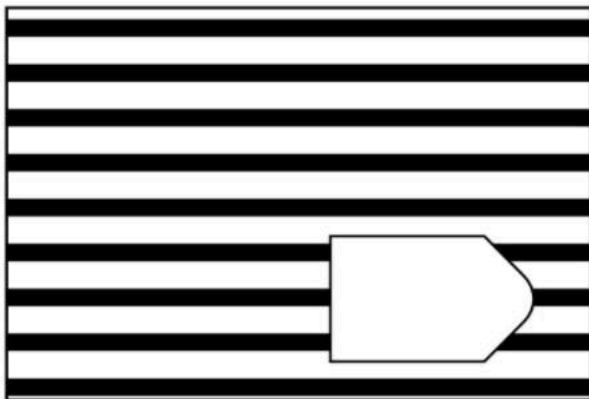


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Raven's Progressive Matrices test

Question 6 of 24

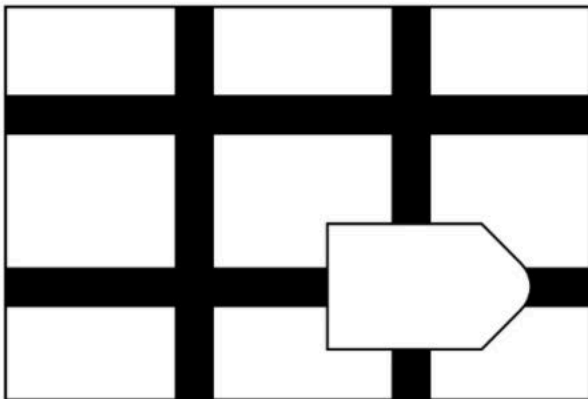


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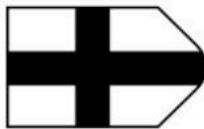


Raven's Progressive Matrices test

Question 7 of 24

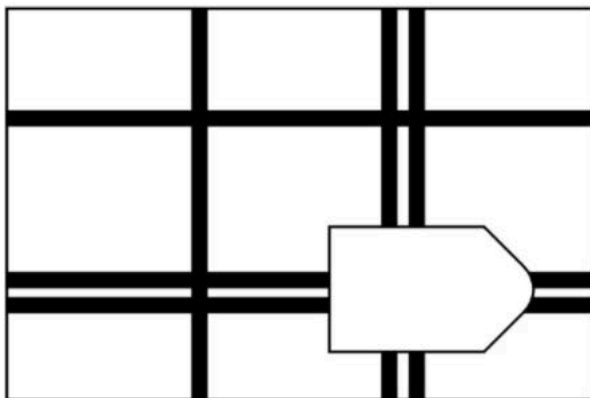


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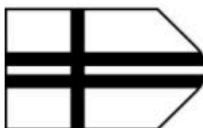
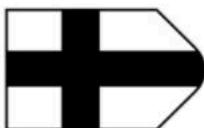
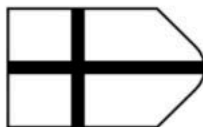
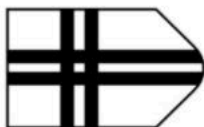
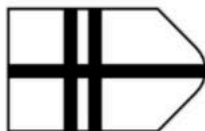


Raven's Progressive Matrices test

Question 8 of 24

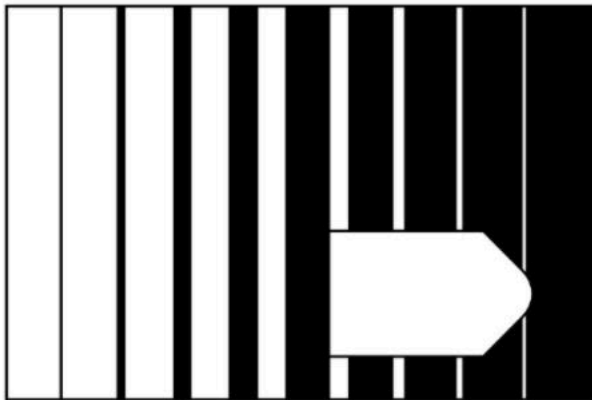


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Raven's Progressive Matrices test

Question 9 of 24

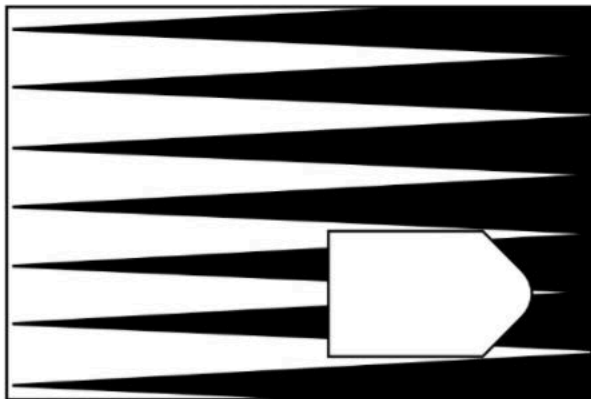


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Raven's Progressive Matrices test

Question 10 of 24

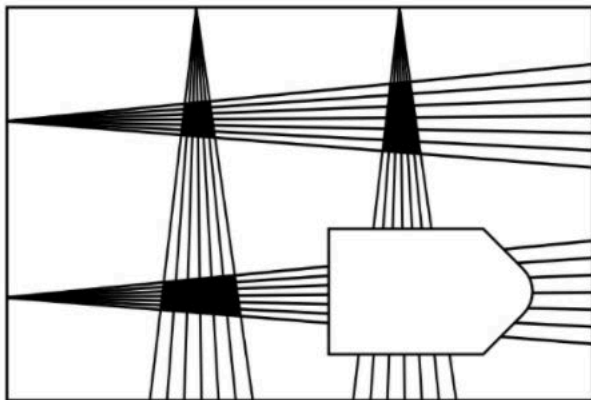


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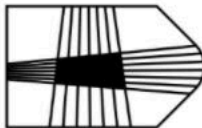
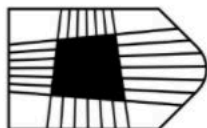
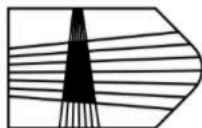
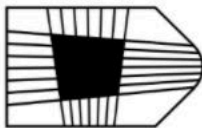
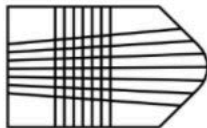
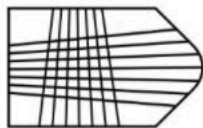


Raven's Progressive Matrices test

Question 11 of 24

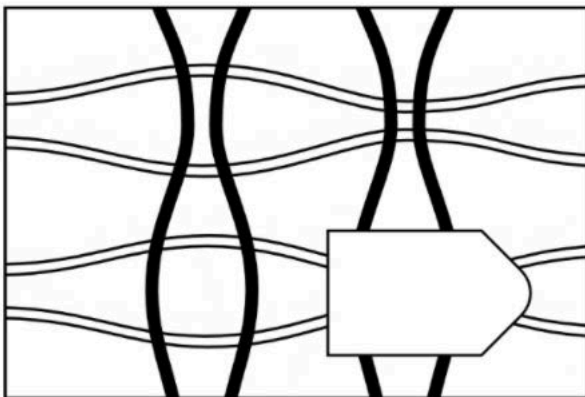


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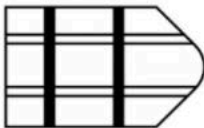
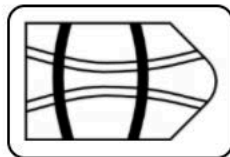
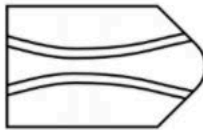
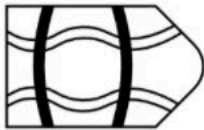
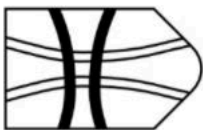


Raven's Progressive Matrices test

Question 12 of 24

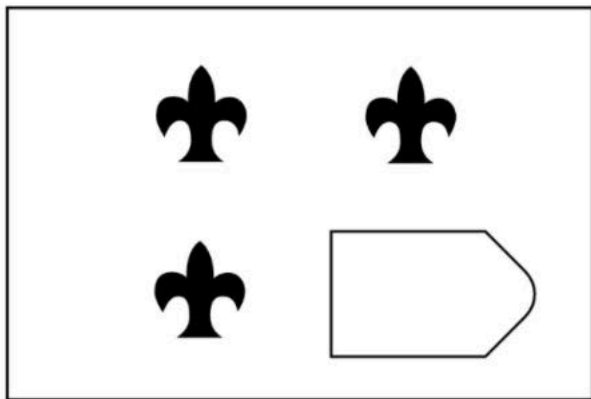


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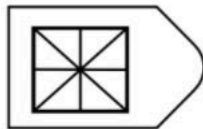
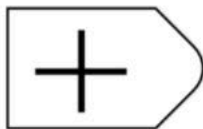


Raven's Progressive Matrices test

Question 13 of 24

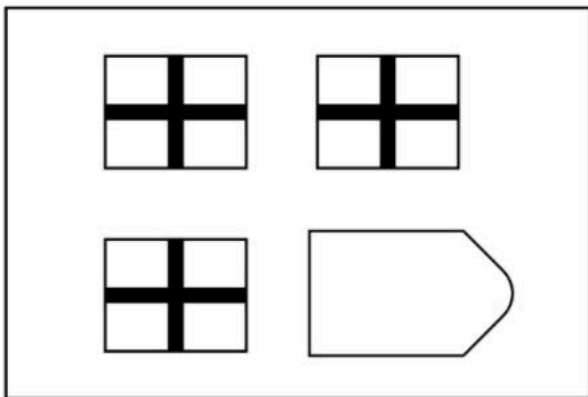


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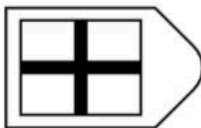
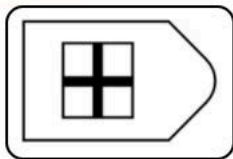
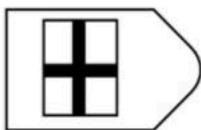
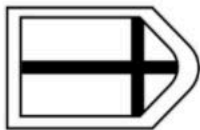


Raven's Progressive Matrices test

Question 14 of 24

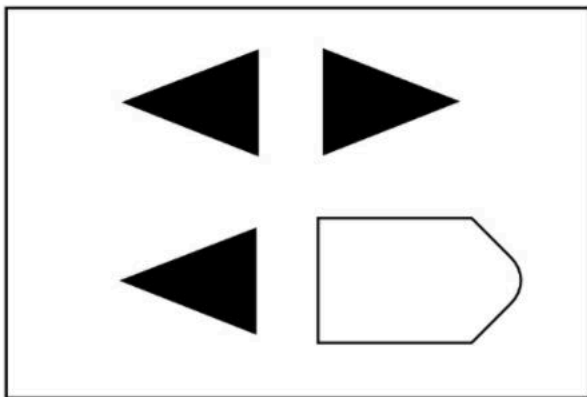


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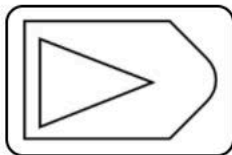
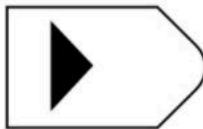
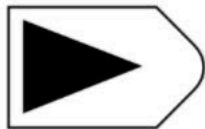


Raven's Progressive Matrices test

Question 15 of 24

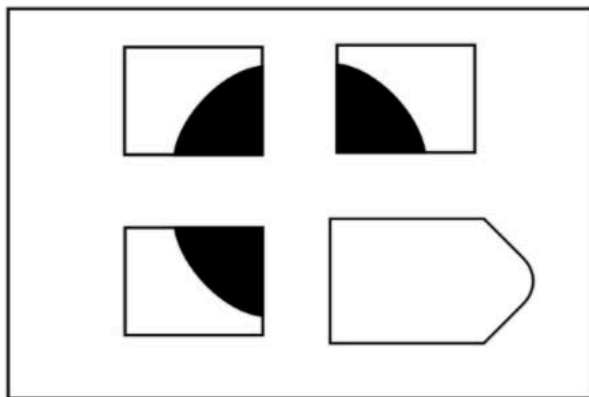


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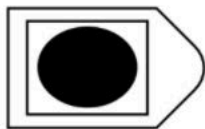
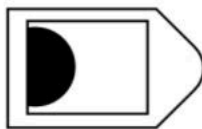


Raven's Progressive Matrices test

Question 16 of 24

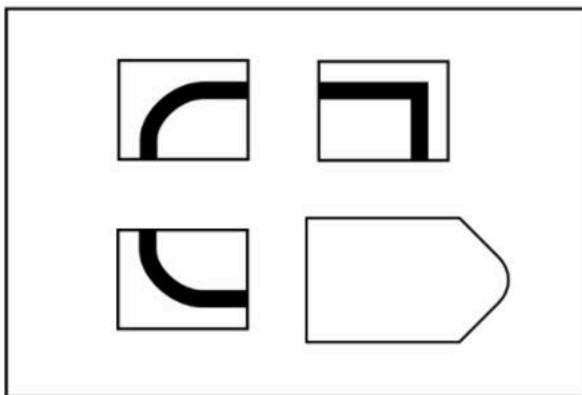


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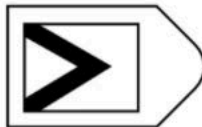
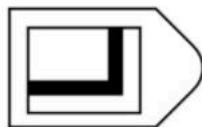


Raven's Progressive Matrices test

Question 17 of 24

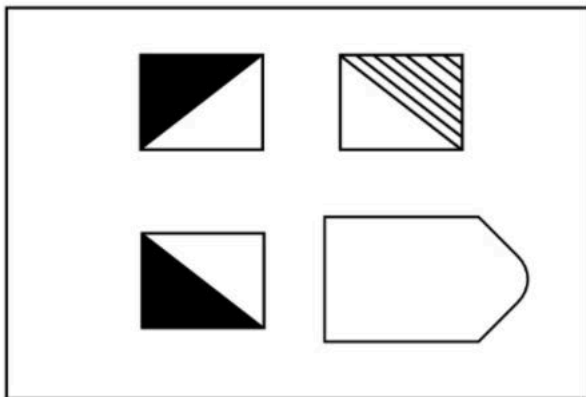


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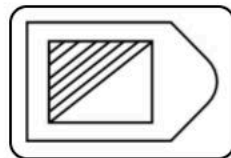
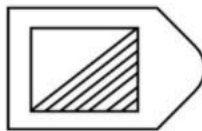
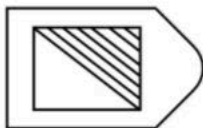


Raven's Progressive Matrices test

Question 18 of 24

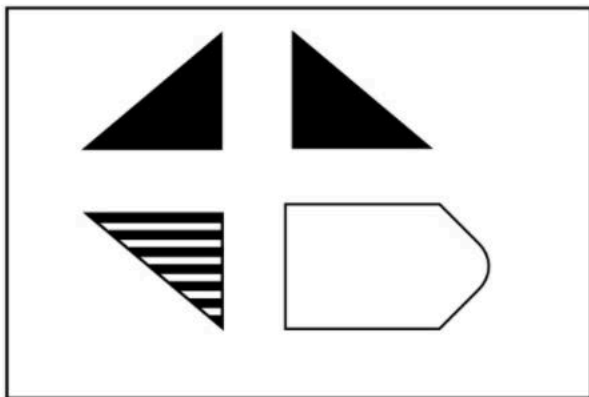


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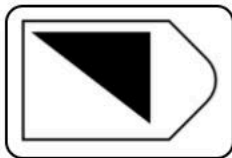


Raven's Progressive Matrices test

Question 19 of 24

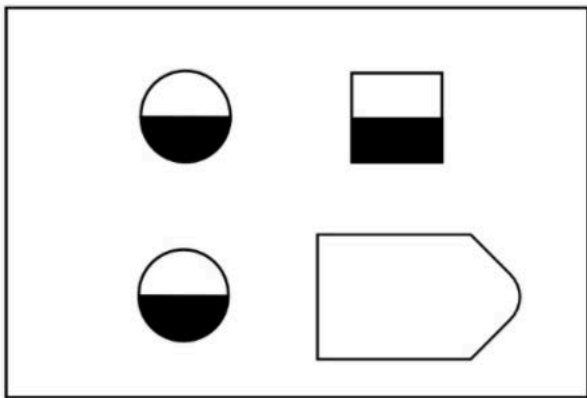


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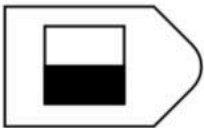
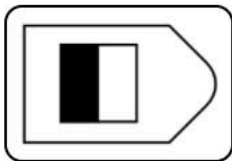
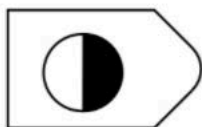
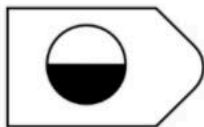
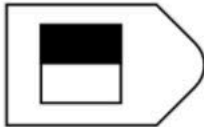
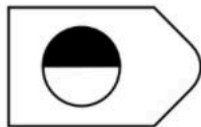


Raven's Progressive Matrices test

Question 20 of 24

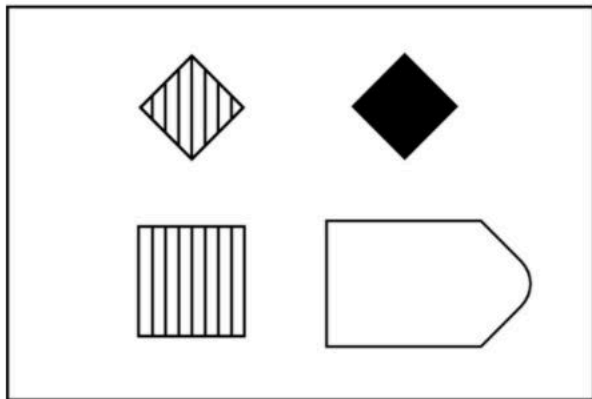


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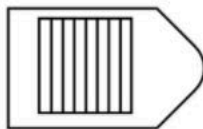
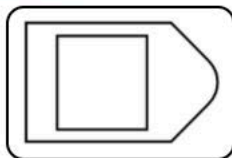
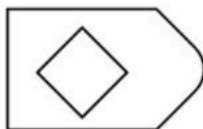


Raven's Progressive Matrices test

Question 21 of 24

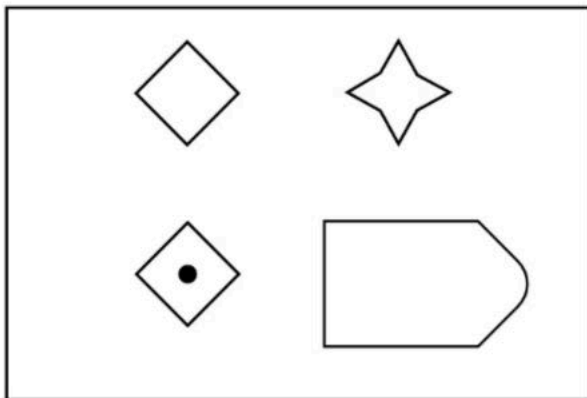


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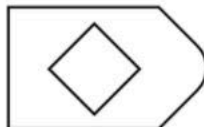
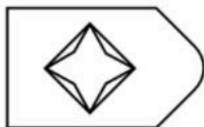
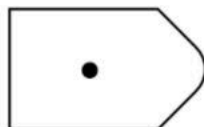
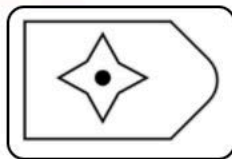
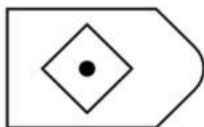
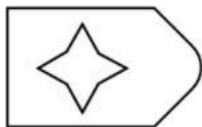


Raven's Progressive Matrices test

Question 22 of 24

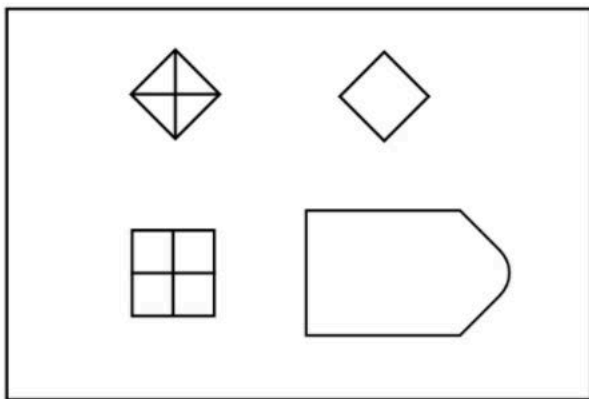


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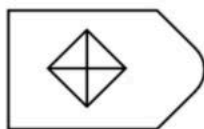
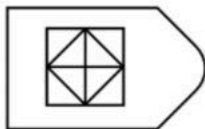
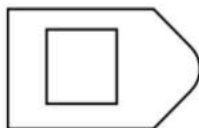
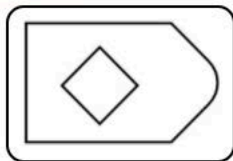
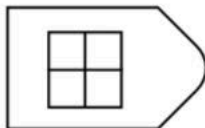
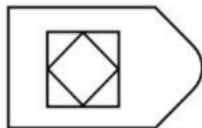


Raven's Progressive Matrices test

Question 23 of 24

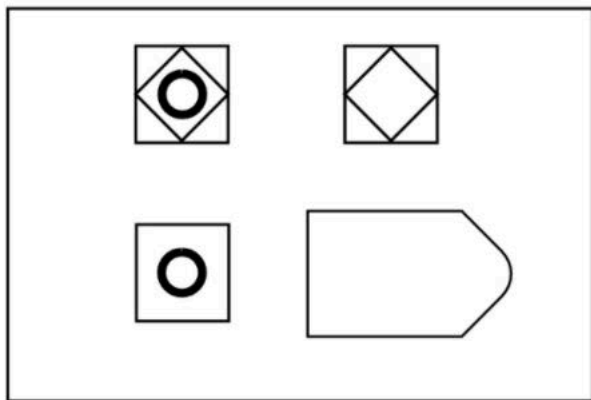


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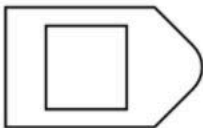
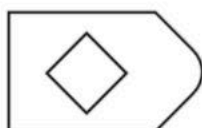
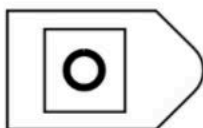
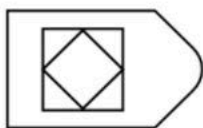


Raven's Progressive Matrices test

Question 24 of 24

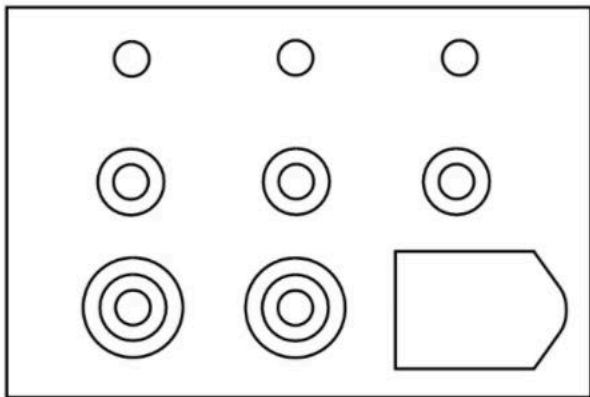


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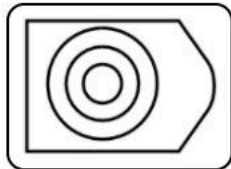
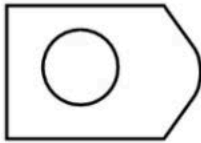
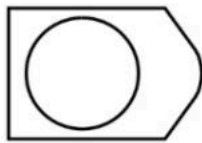
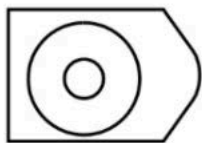
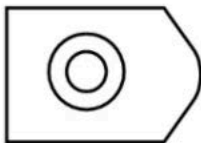
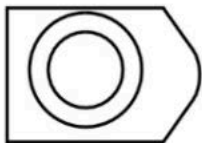


Raven's Progressive Matrices test

Question 1 of 36

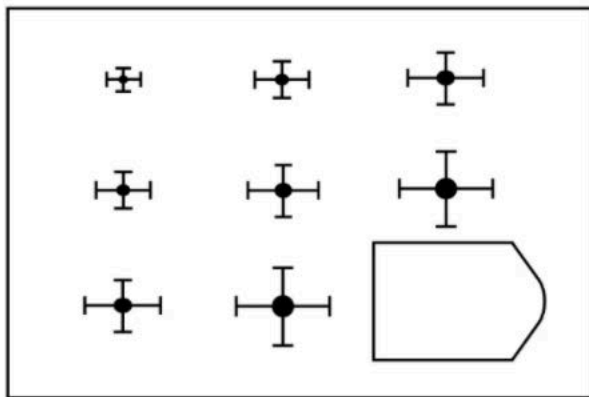


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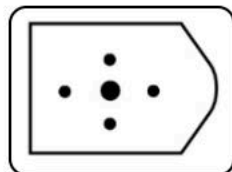
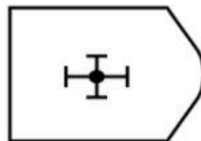
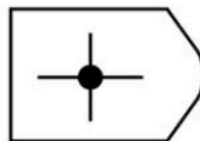
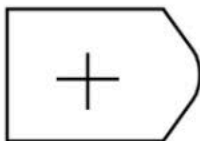
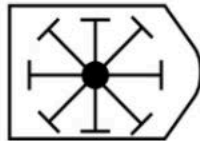
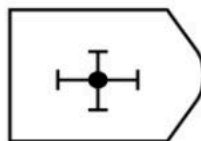
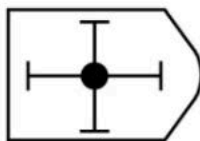
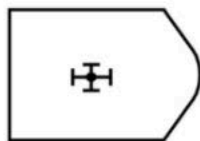


Raven's Progressive Matrices test

Question 2 of 36

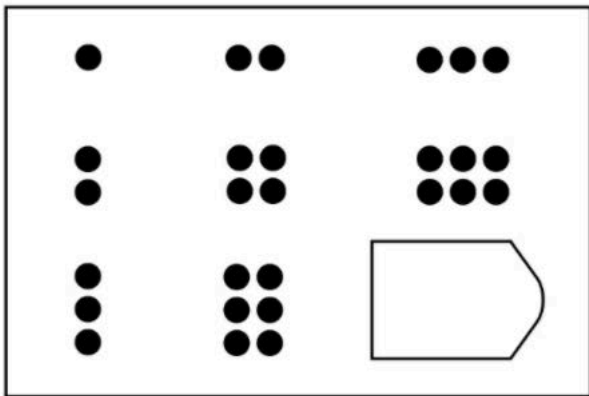


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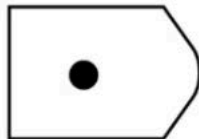
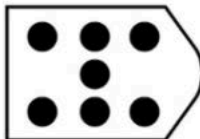
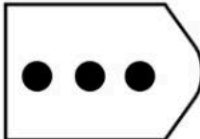
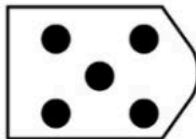
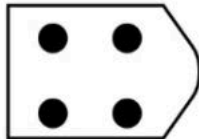
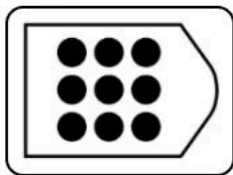
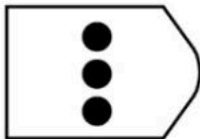
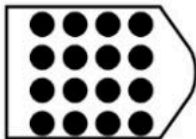


Raven's Progressive Matrices test

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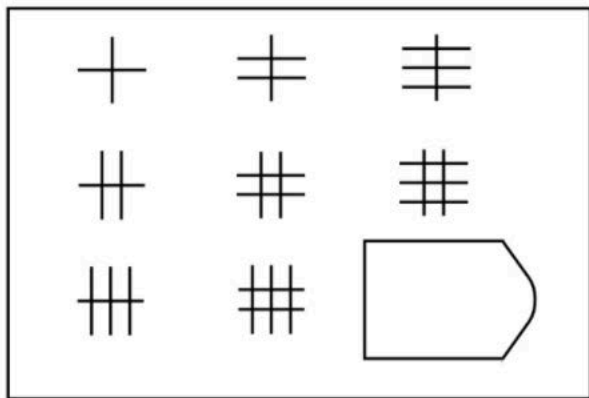


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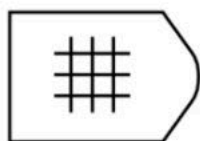
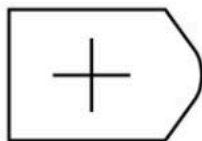
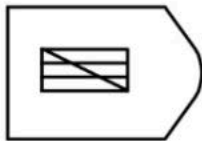
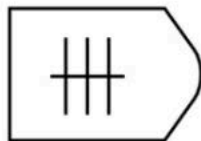
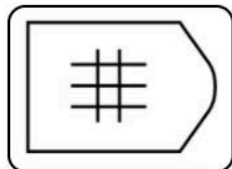
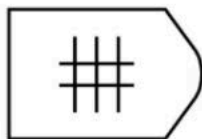
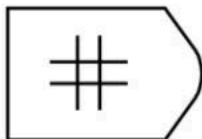
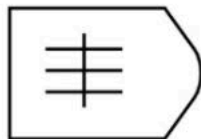


Raven's Progressive Matrices test

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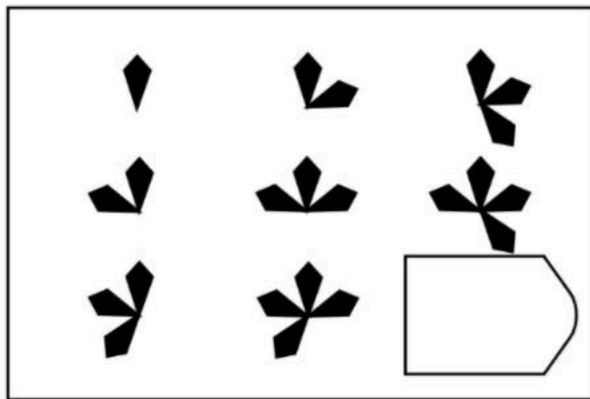


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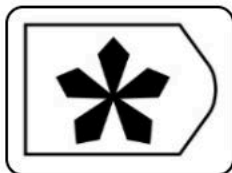
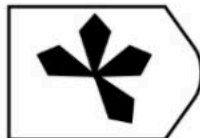


Raven's Progressive Matrices test

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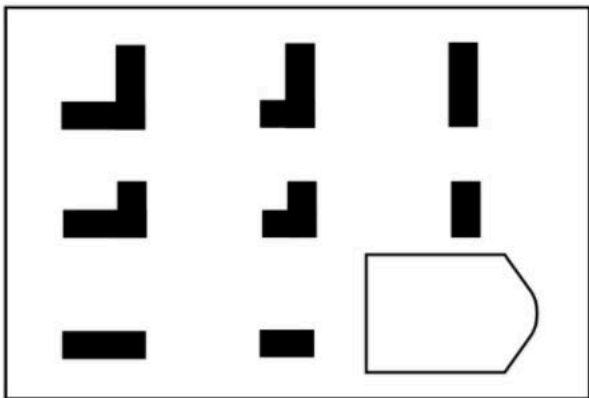


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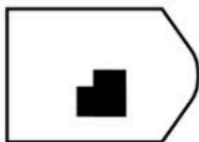
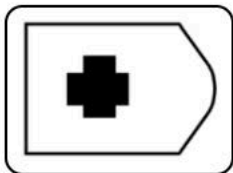
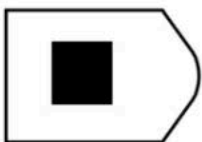
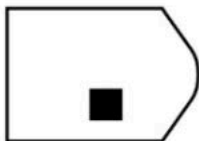


Raven's Progressive Matrices test

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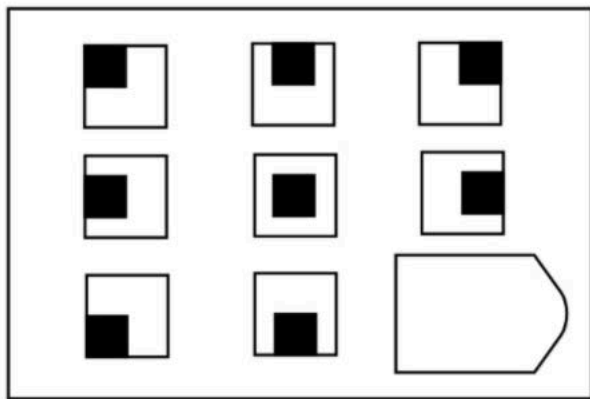


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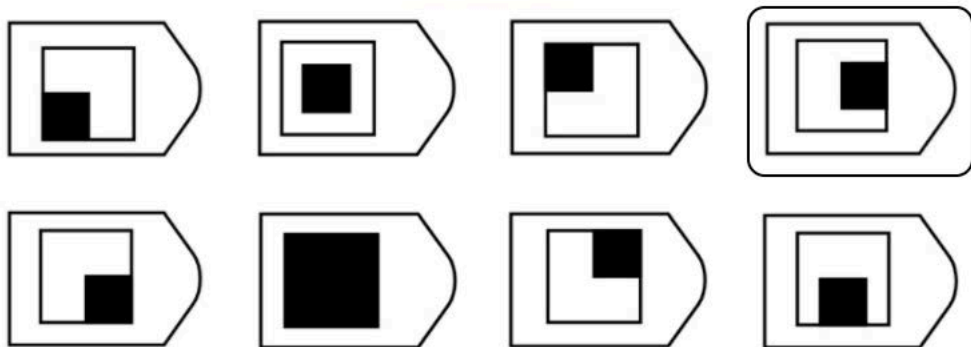


Raven's Progressive Matrices test

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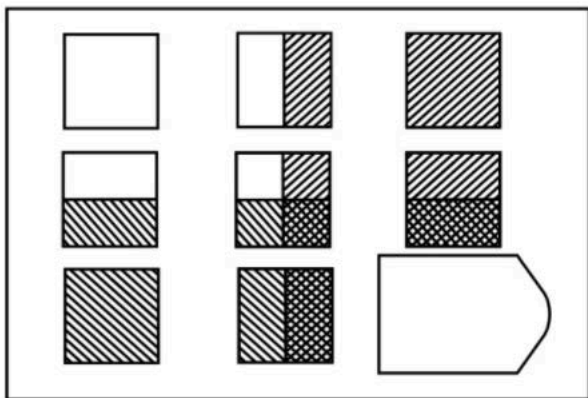


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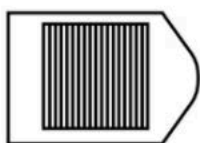
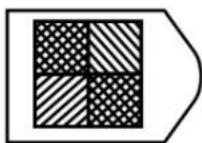
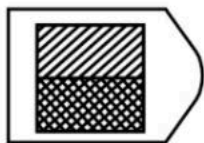
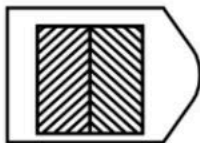
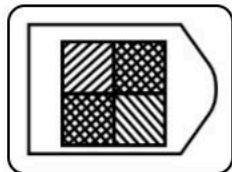
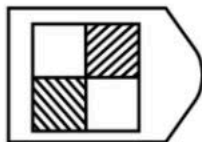
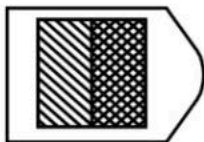
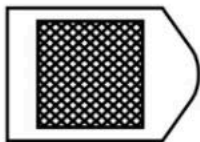


Raven's Progressive Matrices test

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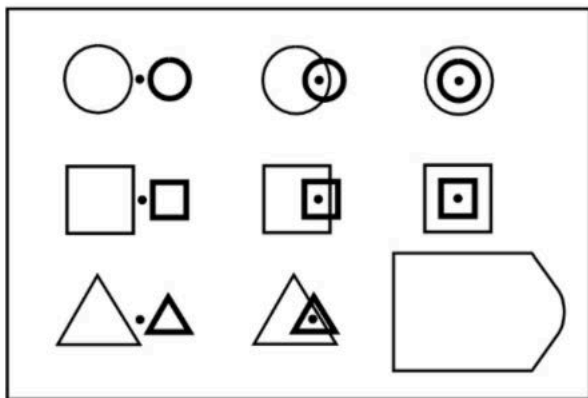


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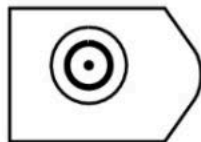
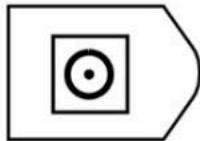
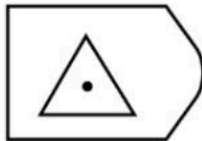
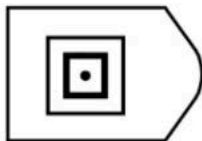


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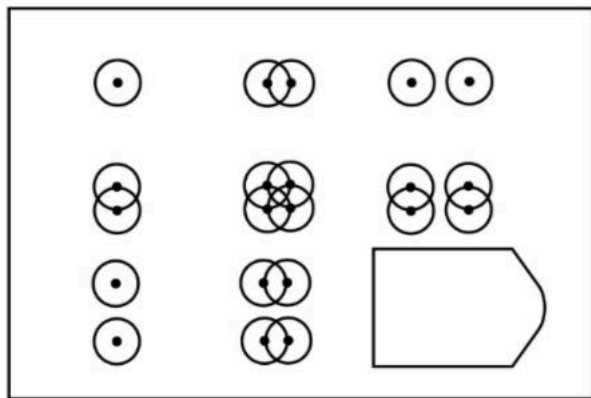


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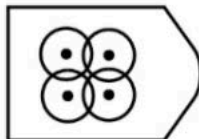
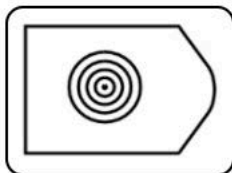
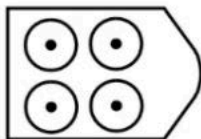
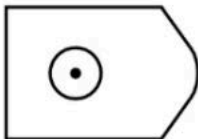
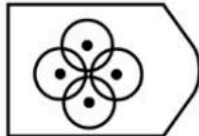
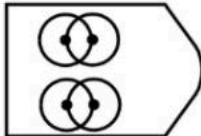
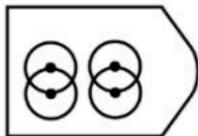


Raven's Progressive Matrices test

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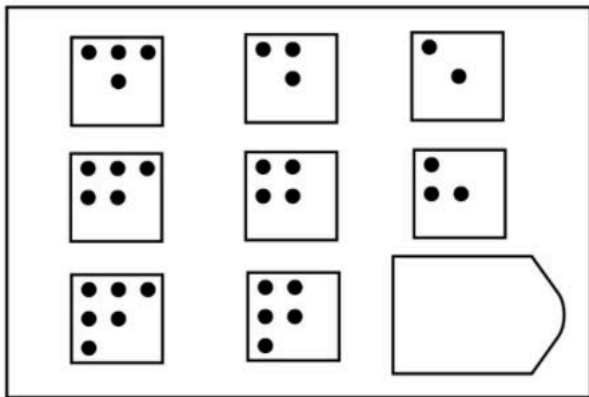


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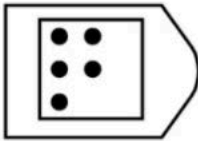
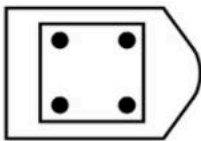
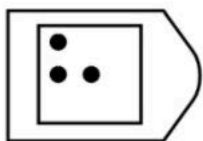
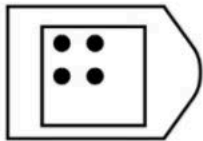
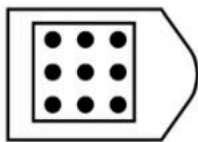
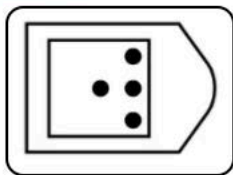
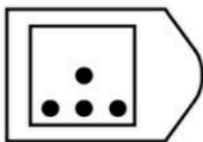
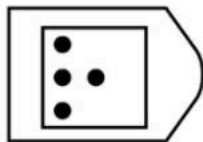


Raven's Progressive Matrices test

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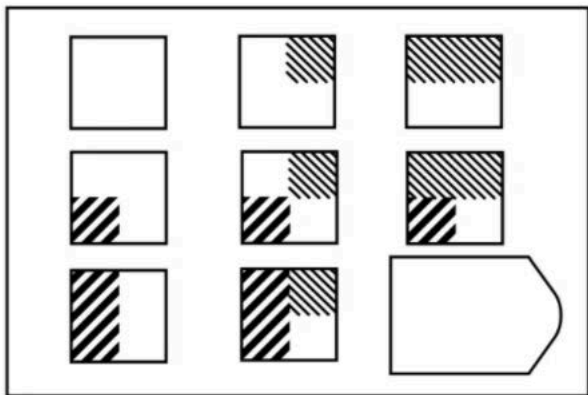


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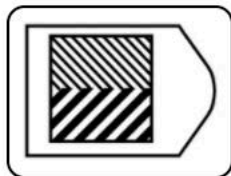
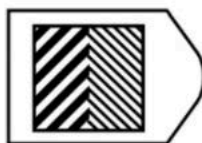


Raven's Progressive Matrices test

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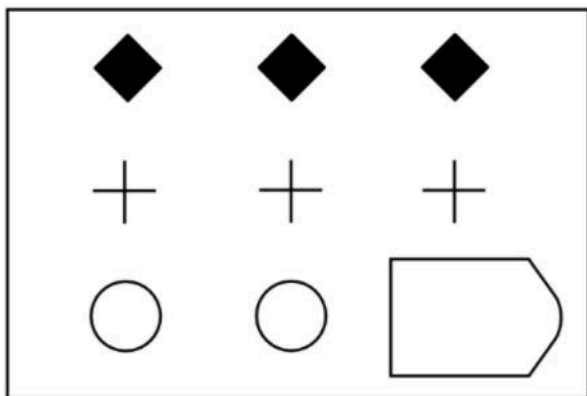


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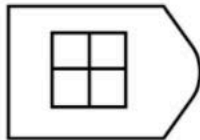
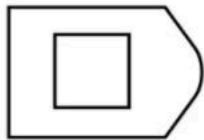
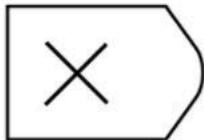
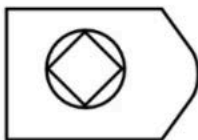
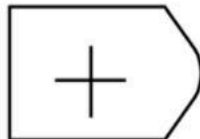
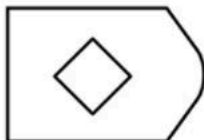
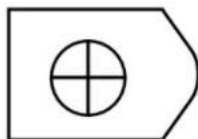


Raven's Progressive Matrices test

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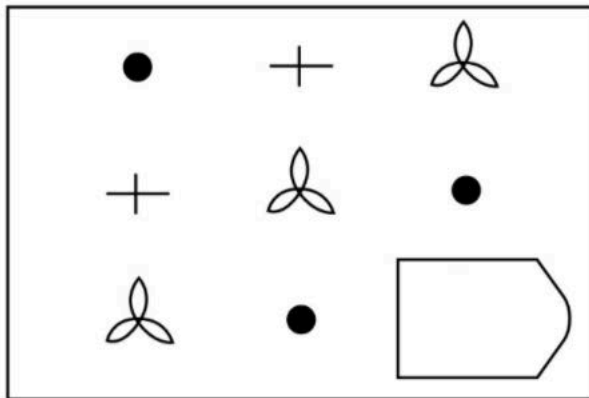


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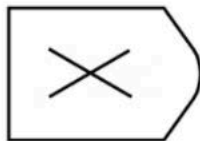
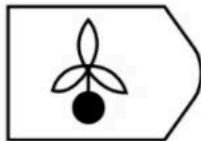
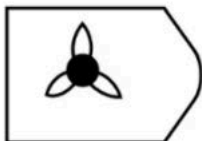
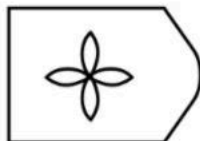
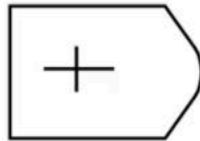
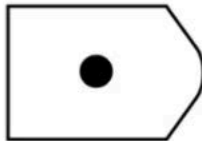
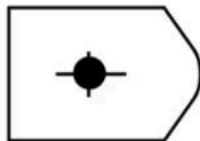


Raven's Progressive Matrices test

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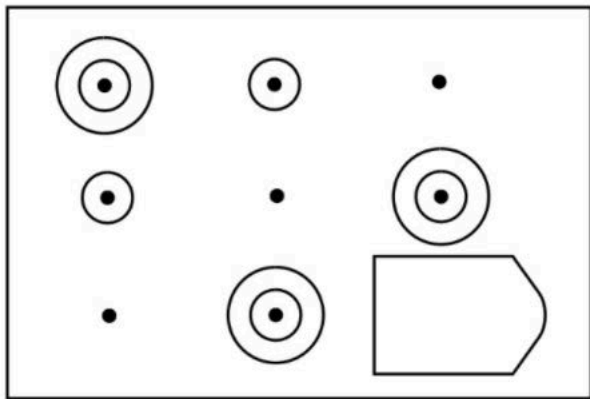


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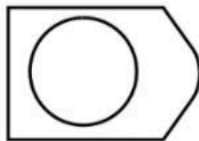
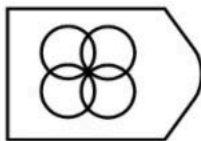
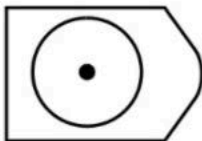
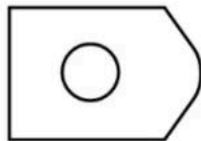
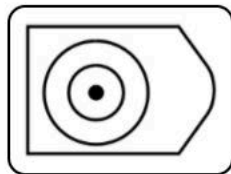
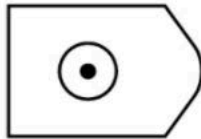
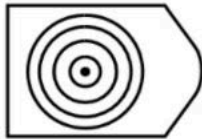
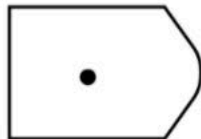


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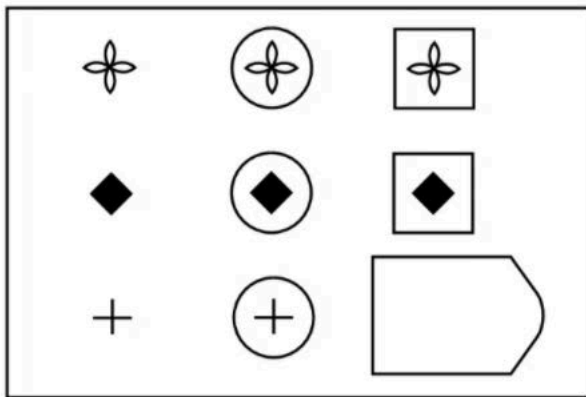


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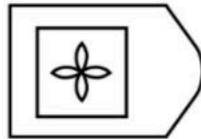
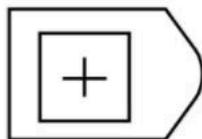
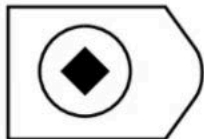
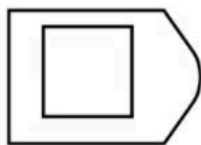
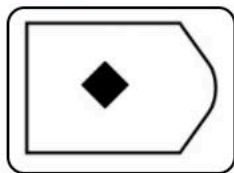
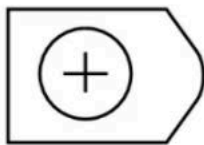
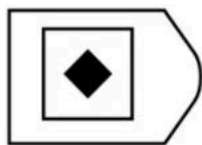


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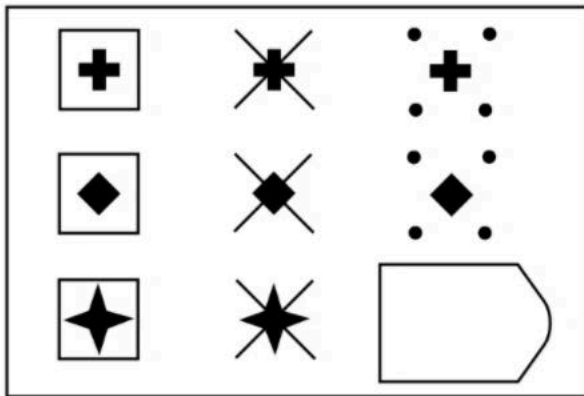


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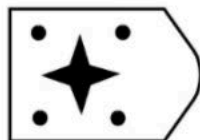
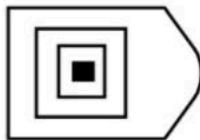
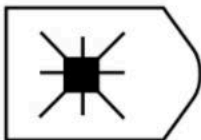
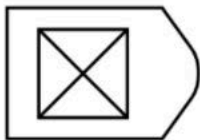
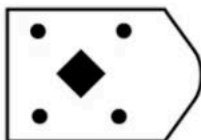
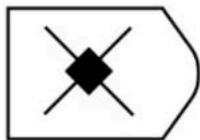


Raven's Progressive Matrices test

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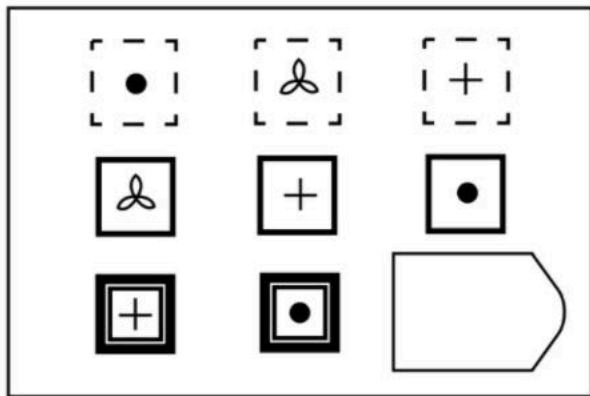


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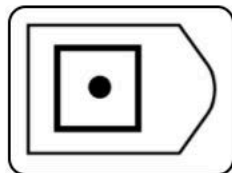
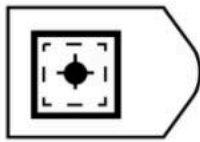
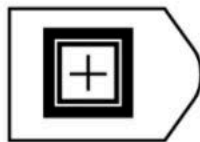
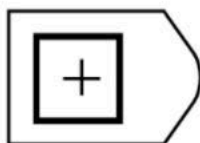
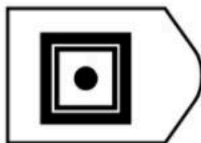
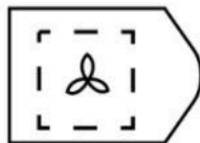


Raven's Progressive Matrices test

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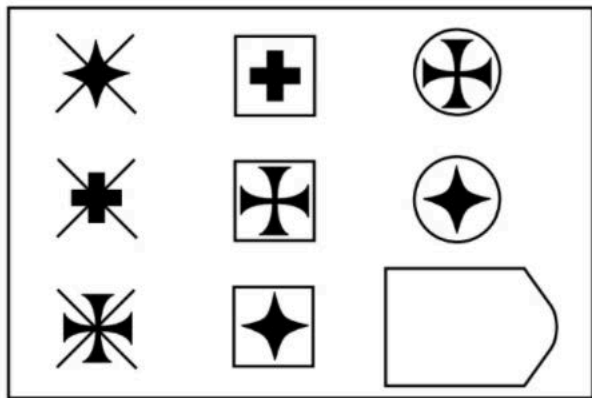


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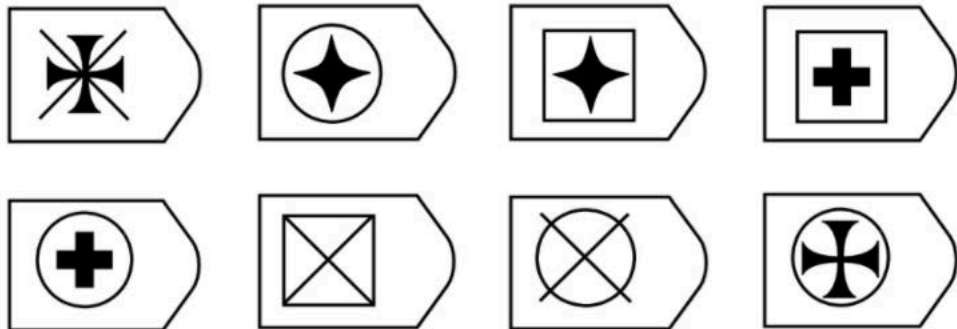


Raven's Progressive Matrices test

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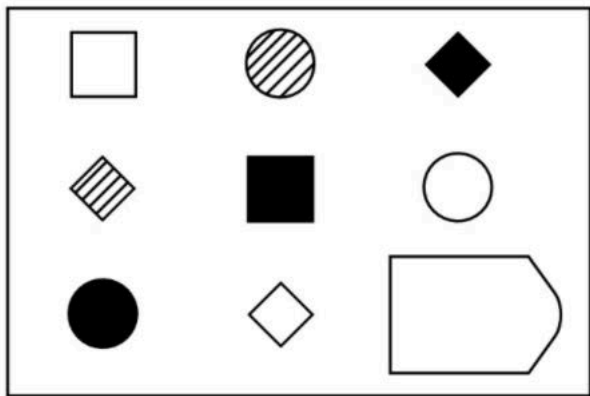


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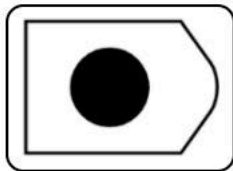
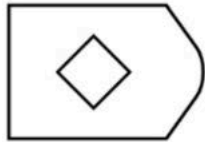
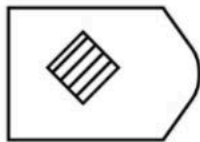
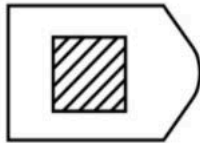
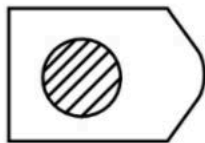
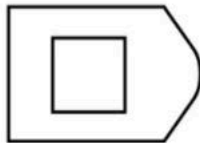


Raven's Progressive Matrices test

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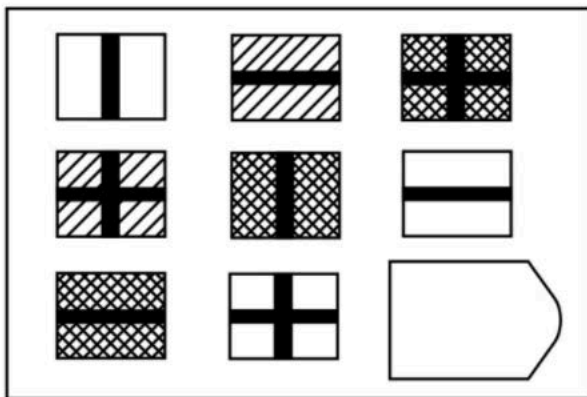


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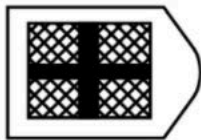
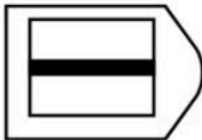
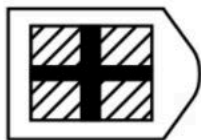
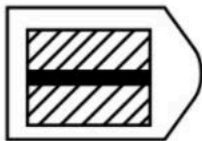


Raven's Progressive Matrices test

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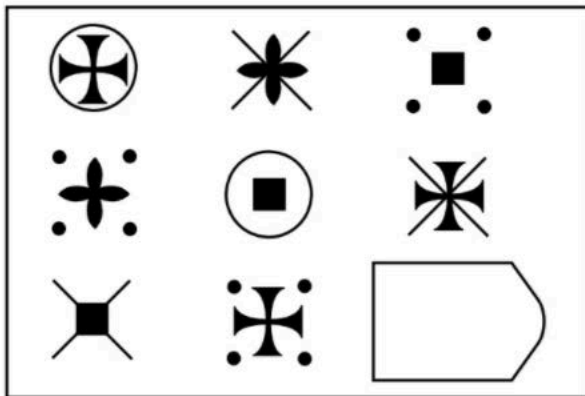


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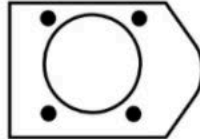
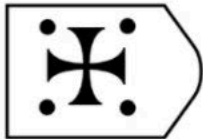
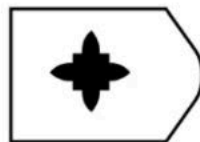
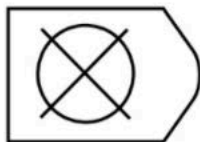


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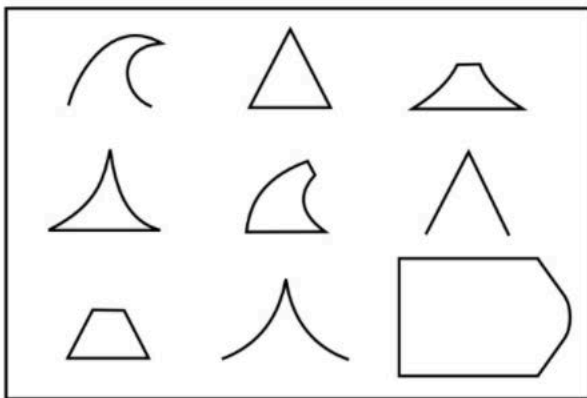


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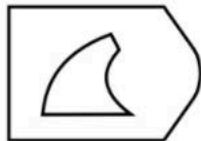
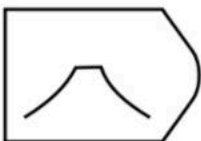
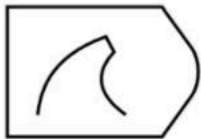
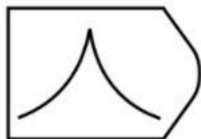


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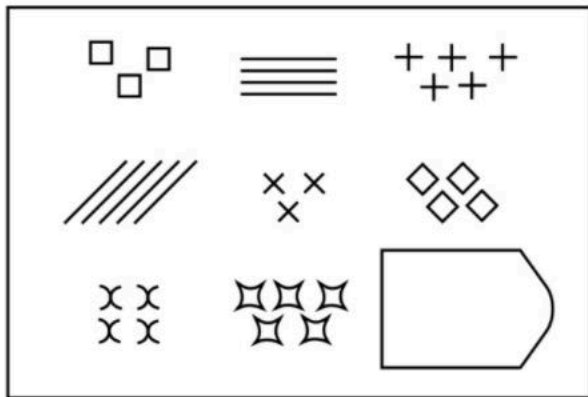


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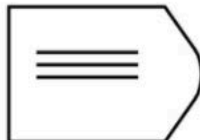
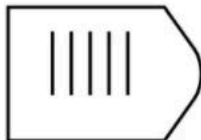
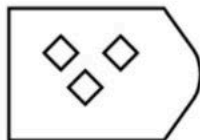
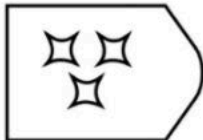
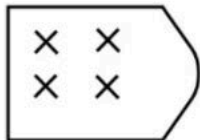


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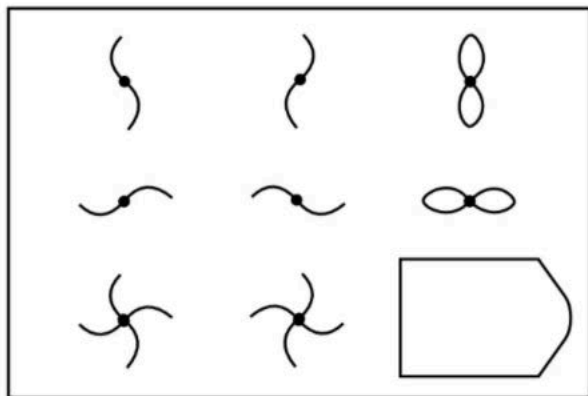


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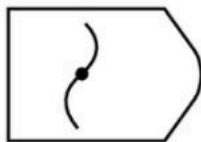
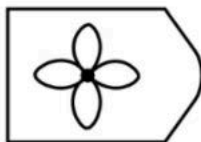
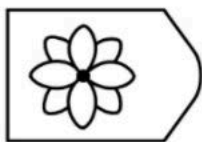
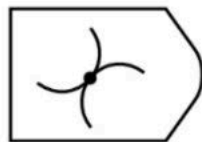
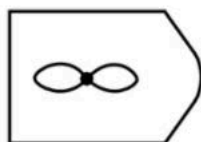


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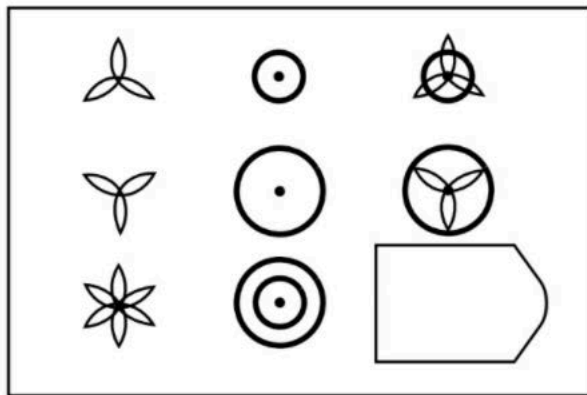


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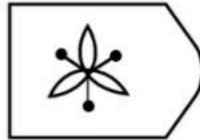
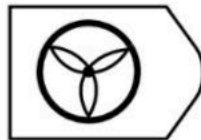
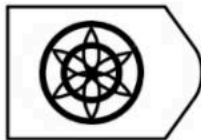
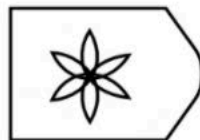
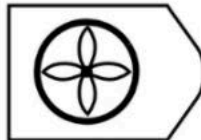
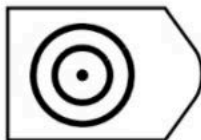
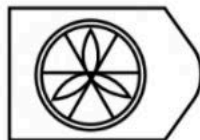


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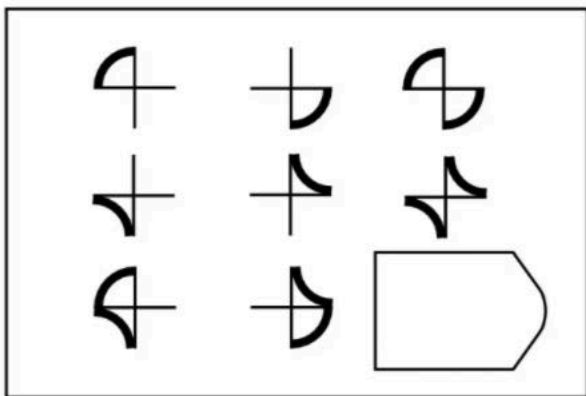


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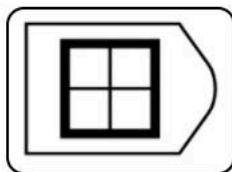
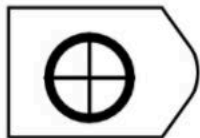
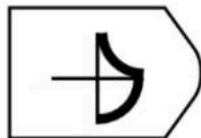


Raven's Progressive Matrices test

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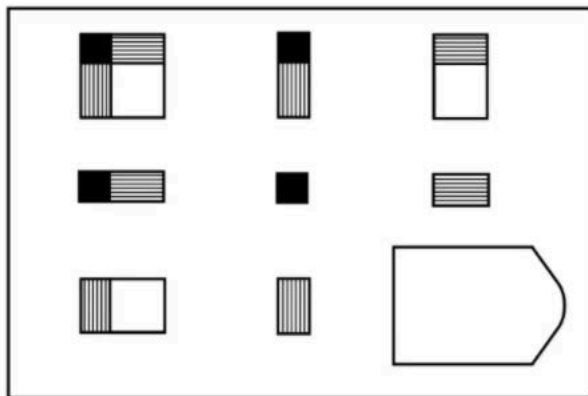


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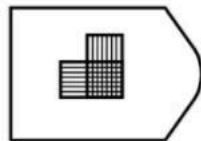
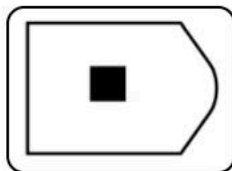
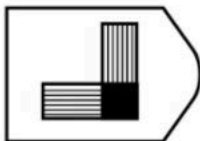
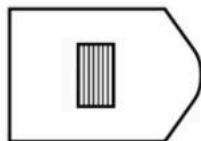
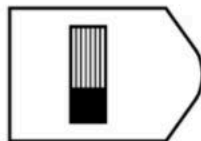
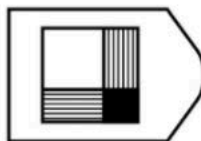
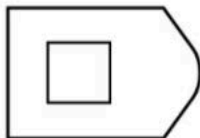
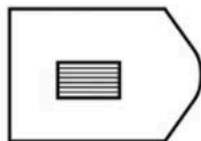


Raven's Progressive Matrices test

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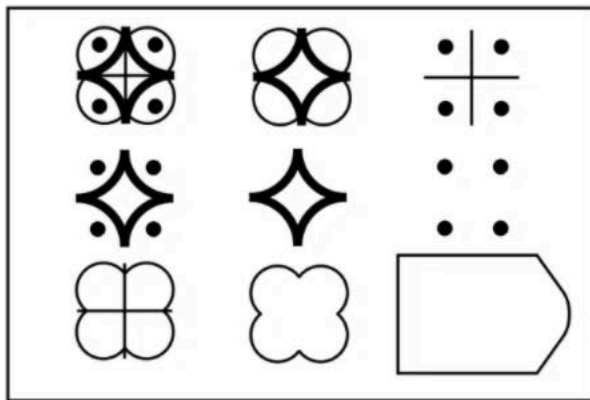


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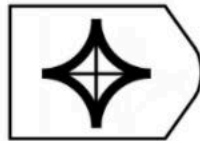
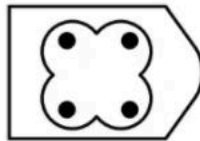
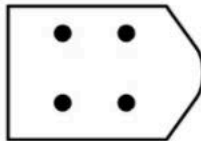
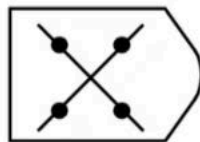
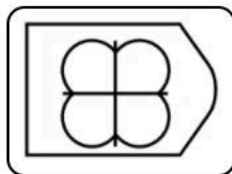
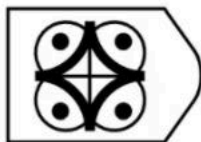
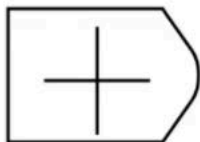


Raven's Progressive Matrices test

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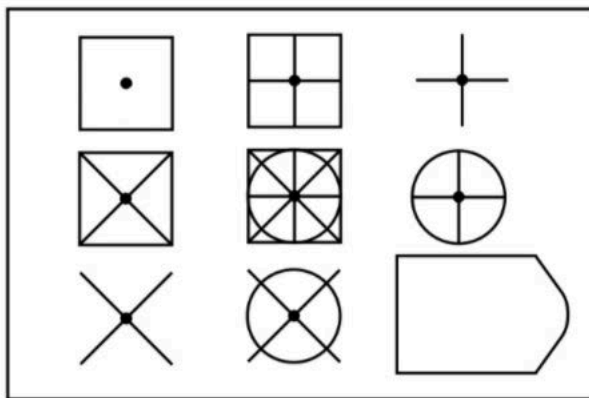


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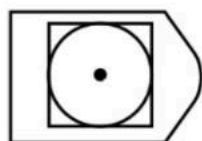
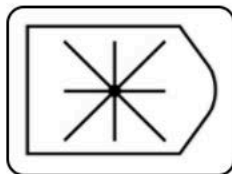
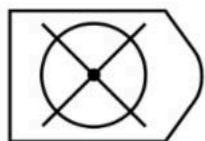
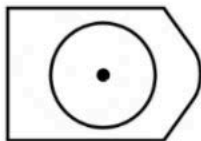
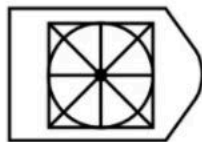
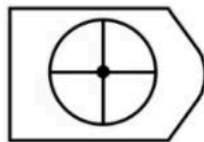
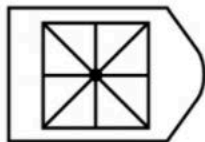
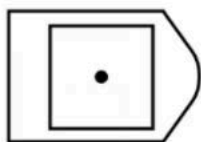


Raven's Progressive Matrices test

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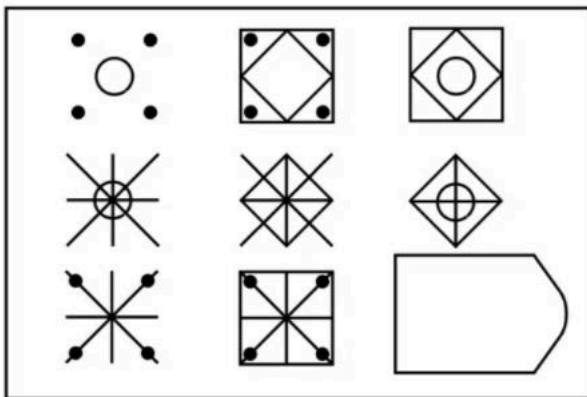


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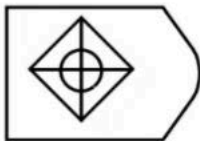
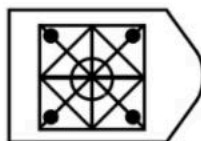
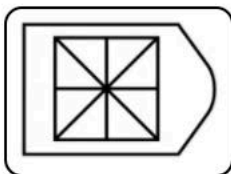
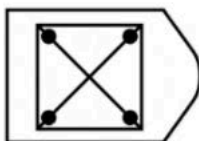
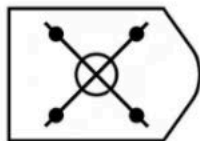
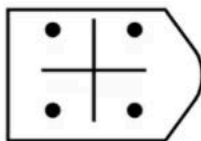
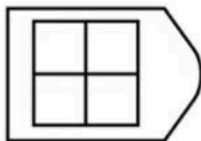
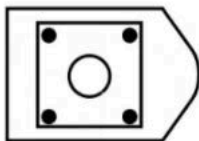


Raven's Progressive Matrices test

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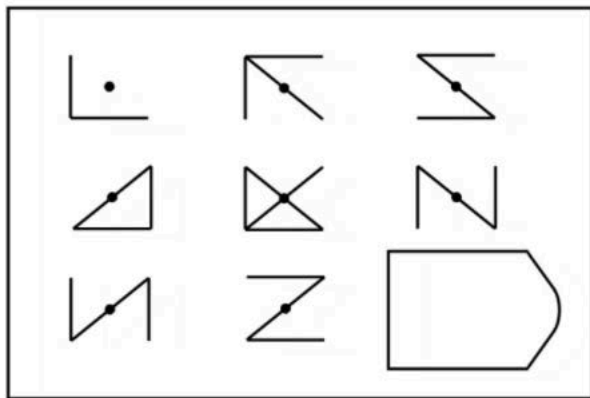


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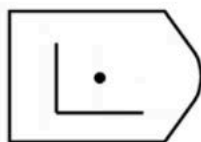
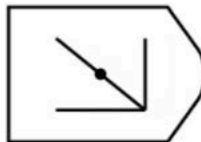
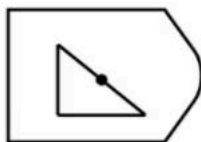
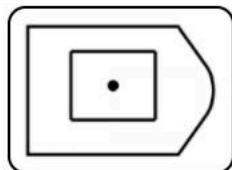
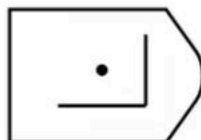
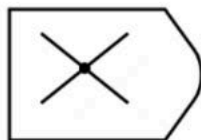
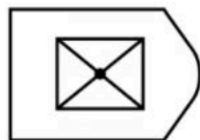


Raven's Progressive Matrices test

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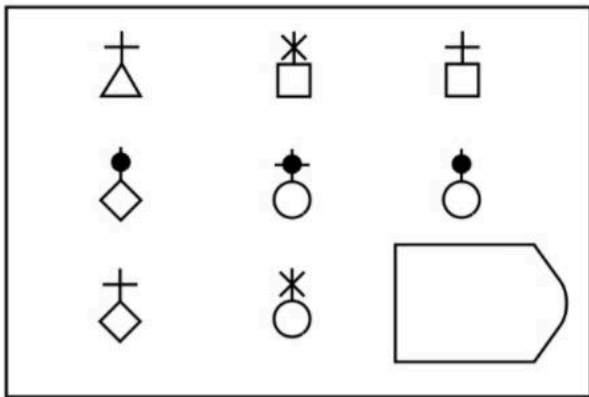


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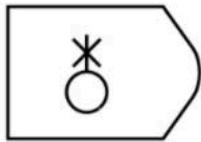
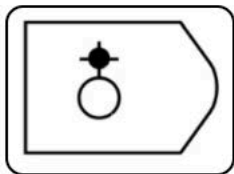
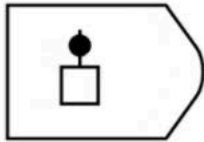
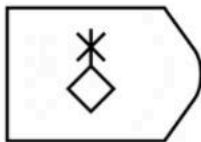
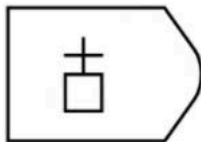
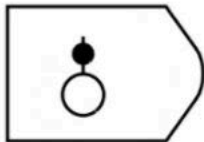
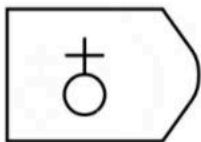


Raven's Progressive Matrices test

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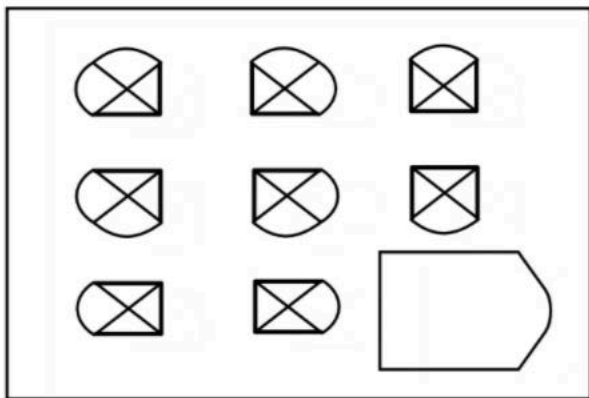


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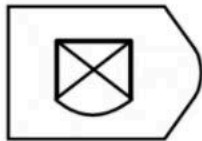
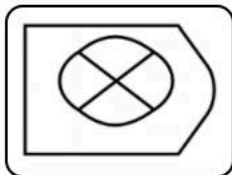
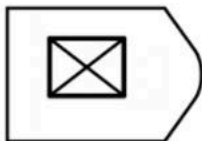
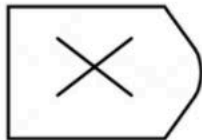
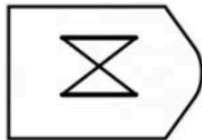
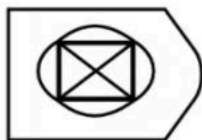
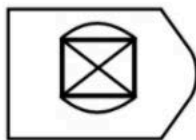


Raven's Progressive Matrices test

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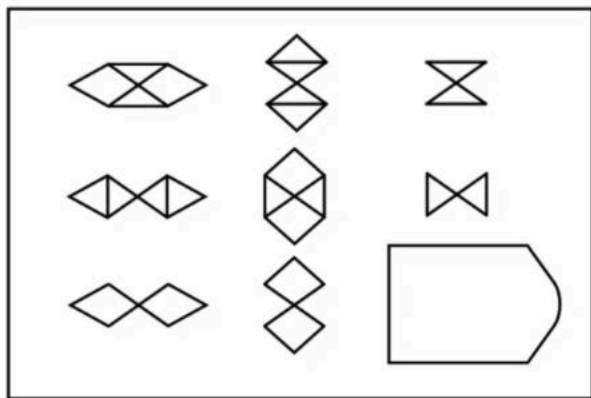


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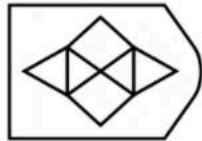
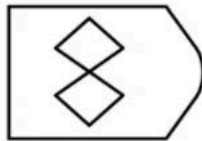
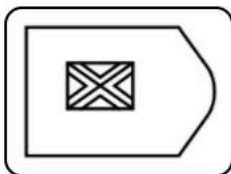
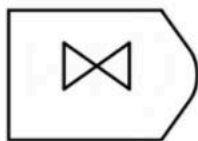
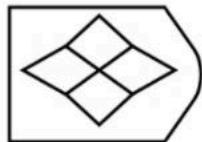
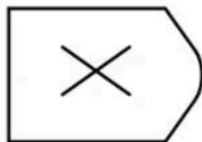
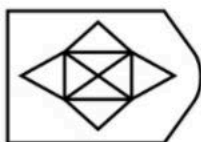
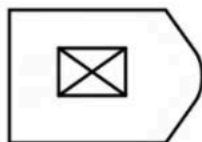


Raven's Progressive Matrices test

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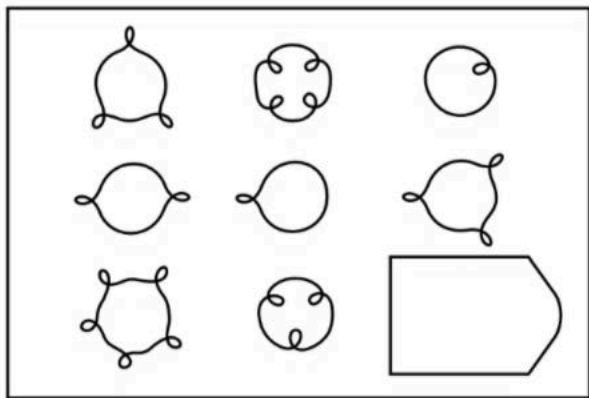


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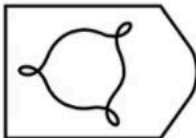
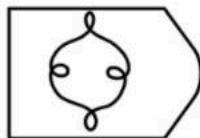
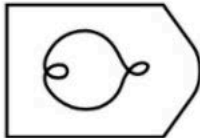
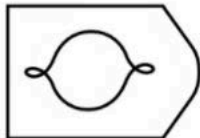
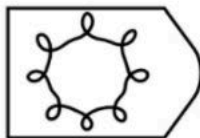
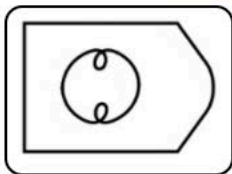
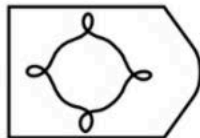


Raven's Progressive Matrices test

Question 36 of 36



Click to choose your answer:



Sleep Diary

Reflecting on the previous day and this morning, please fill out all required and applicable questions on the diary below. We will send you an email on the last day of sleep diaries notifying you that all of the needed questionnaires are complete.

If you have any questions or have trouble loading the survey, please call us immediately at 520-428-5131

At times in this questionnaire, you will be required to write down a time in military time. To make this task easier, consult this chart:

<u>Military Time Conversion</u>			
12:00am	0:00	12:00pm	12:00
1:00am	1:00	1:00pm	13:00
2:00am	2:00	2:00pm	14:00
3:00am	3:00	3:00pm	15:00
4:00am	4:00	4:00pm	16:00
5:00am	5:00	5:00pm	17:00
6:00am	6:00	6:00pm	18:00
7:00am	7:00	7:00pm	19:00
8:00am	8:00	8:00pm	20:00
9:00am	9:00	9:00pm	21:00
10:00am	10:00	10:00pm	22:00
11:00am	11:00	11:00pm	23:00

Sleep Diary 1

Today's Date:

Bedtimes

What time did you wake up for the day?

Military Time (00:00 - 23:59)

What time did you get out of bed today? (Note: this may be different from the time you woke up)

Military Time (00:00 - 23:59)

What time did you get into bed last night?

Military Time (00:00 - 23:59)

What time did you try to go to sleep?

Military Time (00:00 - 23:59)

It took me ____ (hr): ____ (min) to fall asleep

(e.g. 00:15)

I woke up____times during the night (i.e. woke up, then fell asleep again afterward - DOES NOT include your final awakening for the day)

- ☐ 1
☐ 2
☐ 3
☐ 4
☐ 5 or more

My first awakening lasted____minutes

(e.g. 1.5 hours = 90)

My secondawakening lasted____minutes

(e.g. 1.5 hours = 90)

My third awakening lasted____minutes

(e.g. 1.5 hours = 90)

My fourth awakening lasted____minutes

(e.g. 1.5 hours = 90)

My fifth awakening, or subsequent awakenings, lasted
____minutes each (if applicable, separate each time
with a comma)

(e.g. 1.5 hours = 90)

Nightmares

Did you have a nightmare last night?

- ☐ Yes
☐ No

How distressing was the nightmare?

- ☐ 1 (Not at all)
☐ 2
☐ 3 (Distressing)
☐ 4
☐ 5 (Very distressing)

Napping

I took a nap yesterday

- ☐ Yes
☐ No

How many naps did you take?

- ☐ 1
☐ 2
☐ 3

Nap 1

I started napping at:

(Military Time 00:00 - 23:59)

AM or PM

- ☐ AM
☐ PM

I finished napping at:

Military Time 00:00 - 23:59)

AM or PM

- ☐ AM
☐ PM

Nap 2

I started napping at:

Military Time 00:00 - 23:59)

I finished napping at:

Military Time 00:00 - 23:59)

Nap 3

I started napping at:

Military Time 00:00 - 23:59)

I finished napping at:

(Military Time 00:00 - 23:59)

AM or PM

- ☐ AM
☐ PM

Caffeine

I consumed ____ caffeinated beverages yesterday

I consumed caffeine yesterday:

- ☐ Morning
☐ Afternoon
☐ Evening
☐ Not Applicable

General Questions

I woke up this morning feeling:

- ☐ Refreshed
☐ Somewhat refreshed
☐ Fatigued

For most of yesterday I felt:

- ☐ 1 (Very Sleepy)
☐ 2
☐ 3
☐ 4 (Neutral)
☐ 5
☐ 6
☐ 7 (Very Alert)

Yesterday my mood was:

- ☐ 1 (Very Poor)
☐ 2
☐ 3
☐ 4 (Neutral)
☐ 5
☐ 6
☐ 7 (Very Good)

Did you use any electronic media (e.g. computer, television, mobile phone) after 9:00 PM last night?

- ☐ Yes
☐ No

Actiwatch

Did you press the marker button on your actiwatch last night before going to bed?

- ☐ Yes
☐ No

Did you press the marker button on your actiwatch when you got out of bed for the day?

- ☐ Yes
☐ No

Purpose Consisting of 28 items, the SQS evaluates six domains of sleep quality: daytime symptoms, restoration after sleep, problems initiating and maintaining sleep, difficulty waking, and sleep satisfaction. Developers hoped to create a scale that could be used as an all-inclusive assessment tool – a general, efficient measure suitable for evaluating sleep quality in a variety of patient and research populations.

Population for Testing The scale has been validated in individuals aged 18–59 years.

Administration Requiring between 5 and 10 min for administration, the scale is a simple self-report, pencil-and-paper measure.

Reliability and Validity An initial psychometric evaluation conducted by Yi and colleagues [1] found an internal consistency of .92, a test-retest reliability of .81. The SQS is strongly correlated with results obtained on the Pittsburgh Sleep Quality Index (Chap. 67). Scores achieved by the insomnia sample were significantly higher than those of controls, indicating good construct validity.

Obtaining a Copy A list of the scale's 28 items can be found in the original article published by developers [1].

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Scoring Using a four-point, Likert-type scale, respondents indicate how frequently they exhibit certain sleep behaviors (0 = “few,” 1 = “sometimes,” 2 = “often,” and 3 = “almost always”). Scores on items belong to factors 2 and 5 (restoration after sleep and satisfaction with sleep) and are reversed before being tallied. Total scores can range from 0 to 84, with higher scores denoting more acute sleep problems.

Sleep Quality Scale

The following survey is to know the quality of sleep you had for the last one month. Read the questions and check the closest answer.

Examples

Rarely : None or 1-3 times a month

Sometimes : 1-2 times a week

Often : 3-5 times a week

Almost always : 6-7 times a week

		Rarely	Sometimes	Often	Almost always
1	I have difficulty falling asleep.				
2	I fall into a deep sleep.				
3	I wake up while sleeping.				
4	I have difficulty getting back to sleep once I wake up in middle of the night.				
5	I wake up easily because of noise.				
6	I toss and turn.				
7	I never go back to sleep after awakening during sleep.				
8	I feel refreshed after sleep.				
9	I feel unlikely to sleep after sleep.				
10	Poor sleep gives me headaches.				
11	Poor sleep makes me irritated.				
12	I would like to sleep more after waking up.				
13	My sleep hours are enough.				
14	Poor sleep makes me lose my appetite.				
15	Poor sleep makes hard for me to think.				
16	I feel vigorous after sleep.				
17	Poor sleep makes me lose interest in work or others.				
18	My fatigue is relieved after sleep.				

		Rarely	Sometimes	Often	Almost always
19	Poor sleep causes me to make mistakes at work.				
20	I am satisfied with my sleep.				
21	Poor sleep makes me forget things more easily.				
22	Poor sleep makes it hard to concentrate at work.				
23	Sleepiness interferes with my daily life.				
24	Poor sleep makes me lose desire in all things.				
25	I have difficulty getting out of bed.				
26	Poor sleep makes me easily tired at work.				
27	I have a clear head after sleep.				
28	Poor sleep makes my life painful.				

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A number of translated versions such as the two that follow can be found on
our website: www.sleepontario.com

☞ 다음은 귀하의 지난 한달 동안의 수면의 질을 알아보기 위한 것입니다. 각 질문과 아래의 보기를 읽고 가장
가깝다고 생각되는 곳에 v표하여 주십시오.

< 보기 >

거의 그렇지 않다 : 한 달 동안 한 번도 없었거나, 월 1 - 3 회

가끔 그렇다 : 일주일에 1 - 2 회

자주 그렇다 : 일주일에 3 - 5 회

거의 항상 그렇다 : 일주일에 6 - 7 회

	지난 한달 동안에	거의 그렇지 않다	가끔 그렇다	자주 그렇다	거의 항상 그렇다
1	잠드는데 어려움이 있다				
2	잠이 깊이 든다				
3	잠을 자다가 깬다				
4	잠을 자다가 깨면 다시 잠드는데 어려움이 있다				
5	소음으로 인해 잠이 쉽게 깬다				
6	잠을 설친다				
7	잠을 자다가 깨면 다시 잠들지 못한다				
8	잠을 자고 일어나면 몸이 개운하다				
9	잠을 자고 일어나도 자고 난 것 같지 않다				
10	잠을 못자기 때문에 머리가 아프다				
11	잠을 못자기 때문에 짜증이 난다				

	지난 한달 동안에	거의 그렇지 않다	가끔 그렇다	자주 그렇다	거의 항상 그렇다
12	잠을 자고 일어날 때 더 자고 싶은 생각이 든다				
13	수면 시간이 충분하다				
14	잠을 못자기 때문에 식욕이 떨어진다				
15	잠을 못자기 때문에 생각하는데 어려움이 있다				
16	잠을 자고 일어나면 활력을 되찾는다				
17	잠을 못자기 때문에 일이나 다른 사람에 대한 관심이 줄어든다				
18	잠을 자고 일어나면 피로가 풀린다				
19	잠을 못자기 때문에 일하는데 실수가 많아진다				
20	전반적으로 수면(잠)에 대해 만족한다				
21	잠을 못자기 때문에 건망증이 심해진다				
22	잠을 못자기 때문에 일에 집중하기가 어렵다				
23	졸음이 일상생활에 지장을 준다				
24	잠을 못자기 때문에 의욕이 떨어진다				
25	잠을 자고 난 후 잠자리에서 일어나기가 어렵다				
26	잠을 못자기 때문에 일할 때 빨리 피로해진다				
27	잠을 자고 일어나면 머리가 맑다				
28	잠을 못자기 때문에 삶이 고통스럽다				

Reference

1. Yi, H., Shin, K., & Shin, C. (2006). Development of the sleep quality scale. *Journal of Sleep Research*, 15(3), 309–316.

Representative Studies Using Scale

- Howell, A. J., Digdon, N. L., Buro, K., & Sheptycki, A. R. (2008). Relations among mindfulness, well-being, and sleep. *Personality and Individual Differences*, 45, 773–777.

SSQ

Instructions: This scale is made up of a list of statements each of which may or may not be true about you. For each statement circle "definitely true" if you are sure it is true about you and "probably true" if you think it is true but are not absolutely certain. Similarly, you should circle "definitely false" if you are sure the statement is false and "probably false" if you think it is false but are not absolutely certain.

1. If I wanted to go on a trip for a day (for example, to the country or mountains), I would have a hard time finding someone to go with me.

1. definitely false 2. probably false 3. probably true 4. definitely true

2. I feel that there is no one I can share my most private worries and fears with.

1. definitely false 2. probably false 3. probably true 4. definitely true

3. If I were sick, I could easily find someone to help me with my daily chores.

1. definitely false 2. probably false 3. probably true 4. definitely true

4. There is someone I can turn to for advice about handling problems with my family.

1. definitely false 2. probably false 3. probably true 4. definitely true

5. If I decide one afternoon that I would like to go to a movie that evening, I could easily find someone to go with me.

1. definitely false 2. probably false 3. probably true 4. definitely true

6. When I need suggestions on how to deal with a personal problem, I know someone I can turn to.

1. definitely false 2. probably false 3. probably true 4. definitely true

7. I don't often get invited to do things with others.

1. definitely false 2. probably false 3. probably true 4. definitely true

8. If I had to go out of town for a few weeks, it would be difficult to find someone who would look after my house or apartment (the plants, pets, garden, etc.).

1. definitely false 2. probably false 3. probably true 4. definitely true

9. If I wanted to have lunch with someone, I could easily find someone to join me.

1. definitely false 2. probably false 3. probably true 4. definitely true

10. If I was stranded 10 miles from home, there is someone I could call who could come and get me.

1. definitely false 2. probably false 3. probably true 4. definitely true

11. If a family crisis arose, it would be difficult to find someone who could give me good advice about how to handle it.

1. definitely false 2. probably false 3. probably true 4. definitely true

12. If I needed some help in moving to a new house or apartment, I would have a hard time finding someone to help me.

1. definitely false 2. probably false 3. probably true 4. definitely true

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State-Trait Anxiety Inventory for Adults™

Instrument and Scoring Key

Developed by Charles D. Spielberger

in collaboration with R.L. Gorsuch, R. Lushene, P.R. Vagg, and G.A. Jacobs

Published by Mind Garden, Inc.

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SELF-EVALUATION QUESTIONNAIRE STAI Form Y-1

Please provide the following information:

Subject ID _____ Date _____ S _____
Age _____ Gender (Circle) M F T _____

DIRECTIONS:

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel *right now*, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

NOT AT ALL
SOMEWHAT
MODERATELY SO
VERY MUCH SO

- | | | | | |
|--|---|---|---|---|
| 1. I feel calm | 1 | 2 | 3 | 4 |
| 2. I feel secure | 1 | 2 | 3 | 4 |
| 3. I am tense | 1 | 2 | 3 | 4 |
| 4. I feel strained | 1 | 2 | 3 | 4 |
| 5. I feel at ease | 1 | 2 | 3 | 4 |
| 6. I feel upset..... | 1 | 2 | 3 | 4 |
| 7. I am presently worrying over possible misfortunes | 1 | 2 | 3 | 4 |
| 8. I feel satisfied..... | 1 | 2 | 3 | 4 |
| 9. I feel frightened..... | 1 | 2 | 3 | 4 |
| 10. I feel comfortable..... | 1 | 2 | 3 | 4 |
| 11. I feel self-confident..... | 1 | 2 | 3 | 4 |
| 12. I feel nervous | 1 | 2 | 3 | 4 |
| 13. I am jittery..... | 1 | 2 | 3 | 4 |
| 14. I feel indecisive..... | 1 | 2 | 3 | 4 |
| 15. I am relaxed..... | 1 | 2 | 3 | 4 |
| 16. I feel content | 1 | 2 | 3 | 4 |
| 17. I am worried..... | 1 | 2 | 3 | 4 |
| 18. I feel confused..... | 1 | 2 | 3 | 4 |
| 19. I feel steady..... | 1 | 2 | 3 | 4 |
| 20. I feel pleasant..... | 1 | 2 | 3 | 4 |

SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-2

Subject ID _____ Date _____

DIRECTIONS

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you *generally* feel.

ALMOST NEVER
SOMETIMES
OFTEN
ALMOST ALWAYS

- | | | | | |
|--|---|---|---|---|
| 21. I feel pleasant..... | 1 | 2 | 3 | 4 |
| 22. I feel nervous and restless..... | 1 | 2 | 3 | 4 |
| 23. I feel satisfied with myself..... | 1 | 2 | 3 | 4 |
| 24. I wish I could be as happy as others seem to be | 1 | 2 | 3 | 4 |
| 25. I feel like a failure..... | 1 | 2 | 3 | 4 |
| 26. I feel rested..... | 1 | 2 | 3 | 4 |
| 27. I am "calm, cool, and collected"..... | 1 | 2 | 3 | 4 |
| 28. I feel that difficulties are piling up so that I cannot overcome them | 1 | 2 | 3 | 4 |
| 29. I worry too much over something that really doesn't matter..... | 1 | 2 | 3 | 4 |
| 30. I am happy..... | 1 | 2 | 3 | 4 |
| 31. I have disturbing thoughts..... | 1 | 2 | 3 | 4 |
| 32. I lack self-confidence..... | 1 | 2 | 3 | 4 |
| 33. I feel secure..... | 1 | 2 | 3 | 4 |
| 34. I make decisions easily | 1 | 2 | 3 | 4 |
| 35. I feel inadequate..... | 1 | 2 | 3 | 4 |
| 36. I am content..... | 1 | 2 | 3 | 4 |
| 37. Some unimportant thought runs through my mind and bothers me..... | 1 | 2 | 3 | 4 |
| 38. I take disappointments so keenly that I can't put them out of my mind | 1 | 2 | 3 | 4 |
| 39. I am a steady person..... | 1 | 2 | 3 | 4 |
| 40. I get in a state of tension or turmoil as I think over my recent concerns and interests..... | 1 | 2 | 3 | 4 |

**State-Trait Anxiety Inventory
for AdultsTM
Scoring Key**

Developed by Charles D. Spielberger
in collaboration with R.L. Gorsuch, R. Lushene, P.R. Vagg, and G.A. Jacobs

Published by Mind Garden, Inc.

info@mindgarden.com
www.mindgarden.com

State-Trait Anxiety Inventory for Adults Scoring Key (Form Y-1, Y-2)

Developed by **Charles D. Spielberger** in collaboration with R.L. Gorsuch, R. Lushene, P.R. Vagg, and G.A. Jacobs

To use this stencil, fold this sheet in half and line up with the appropriate test side, either Form Y-1 or Form Y-2. Simply total the scoring **weights** shown on the stencil for each response category. For example, for question # 1, if the respondent marked 3, then the **weight** would be **2**. Refer to the manual for appropriate normative data.

Form Y-1	NOT AT ALL SOMEWHAT MODERATELY SO VERY MUCH SO				Form Y-2	ALMOST NEVER SOMETIMES OFTEN ALMOST ALWAYS			
	4	3	2	1		4	3	2	1
1.	4	3	2	1	21.	4	3	2	1
2.	4	3	2	1	22.	1	2	3	4
3.	1	2	3	4	23.	4	3	2	1
4.	1	2	3	4	24.	1	2	3	4
5.	4	3	2	1	25.	1	2	3	4
6.	1	2	3	4	26.	4	3	2	1
7.	1	2	3	4	27.	4	3	2	1
8.	4	3	2	1	28.	1	2	3	4
9.	1	2	3	4	29.	1	2	3	4
10.	4	3	2	1	30.	4	3	2	1
11.	4	3	2	1	31.	1	2	3	4
12.	1	2	3	4	32.	1	2	3	4
13.	1	2	3	4	33.	4	3	2	1
14.	1	2	3	4	34.	4	3	2	1
15.	4	3	2	1	35.	1	2	3	4
16.	4	3	2	1	36.	4	3	2	1
17.	1	2	3	4	37.	1	2	3	4
18.	1	2	3	4	38.	1	2	3	4
19.	4	3	2	1	39.	4	3	2	1
20.	4	3	2	1	40.	1	2	3	4

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Authors: ***Charles D. Spielberger, in collaboration with R.L. Gorsuch, G.A. Jacobs, R. Lushene, and P.R. Vagg***

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CHRONOLOGY OF EDUCATION

8/83 - 5/85 A.A. (Liberal Arts), San Antonio College
8/83 - 5/85 A.A.S (Radio-TV-Film), San Antonio College
8/85 - 5/90 B.A. (Psychology), *Summa cum laude* with Distinction, University of New Mexico
8/90 - 5/92 M.A. (Clinical Psychology), Texas Tech University
8/92 - 8/96 Ph.D. (Clinical Psychology), Texas Tech University
Dissertation Title: *Development and validation of a new instrument for the measurement of transient mood states: The facial analogue mood scale (FAMS)*. Lubbock, TX: Texas Tech University;1995. Advisor: Bill Locke, Ph.D.

POST-DOCTORAL TRAINING

8/95 - 7/96 Predoctoral Fellow, Clinical Psychology, Yale School of Medicine
8/96 - 7/97 Postdoctoral Fellow, Clinical Neuropsychology, University of OK Health Sciences Center
8/97 - 7/99 Postdoctoral Fellow, Clinical Neuropsychology, University of Pennsylvania Medical School
7/99 - 9/00 Research Fellow, Neuroimaging, McLean Hospital/ Harvard Medical School
9/13 - 5/14 Certificate in Applied Biostatistics, Harvard Medical School

LICENSURE/CERTIFICATION

2001 - Licensed Psychologist, #966, State of New Hampshire

CHRONOLOGY OF EMPLOYMENT

Academic Appointments

10/00 - 8/02 Instructor in Psychology in the Department of Psychiatry
Harvard Medical School, Boston, MA

9/02 - 7/07 Clinical Instructor in Psychology in the Department of Psychiatry
Harvard Medical School, Boston, MA

8/07 - 10/10 Instructor in Psychology in the Department of Psychiatry
Harvard Medical School, Boston, MA

4/08- Faculty Affiliate, Division of Sleep Medicine
Harvard Medical School, Boston, MA

10/10 - 10/12 Assistant Professor of Psychology in the Department of Psychiatry
Harvard Medical School, Boston, MA

10/12 - 6/17 Associate Professor of Psychology in the Department of Psychiatry
Harvard Medical School, Boston, MA

7/14- Professor of Psychiatry—Tenured
University of Arizona College of Medicine, Tucson, AZ

7/14- Professor of Medical Imaging
University of Arizona College of Medicine, Tucson, AZ

9/14- Professor of Psychology
University of Arizona College of Science, Tucson, AZ

Hospital/Clinical/Institutional Appointments

10/00 - 8/02 Assistant Research Psychologist, McLean Hospital, Belmont, MA

8/02 - 7/04 Research Psychologist, Department of Behavioral Biology, Walter Reed Army Institute of Research, Silver Spring, MD

7/04 - 10/07 Chief, Neurocognitive Performance Branch, Walter Reed Army Institute of Research, Silver Spring, MD

10/07 - 3/10 DoD Contractor, Chief Psychologist, GovSource, Inc., U.S. Department of Defense (DoD)

8/08 Consulting Psychologist, The Brain Institute, University of Utah

9/02 - 4/05 Special Volunteer, National Institute on Deafness and Other Communication Disorders (NIDCD), National Institutes of Health (NIH), Bethesda, MD

9/02 - 7/07 Research Consultant, McLean Hospital, Belmont, MA

8/05 - 5/06 Neuropsychology Postdoctoral Research Program Training Supervisor, Walter Reed Hospital, Washington, DC

8/07 -6/17 Research Psychologist, McLean Hospital, Belmont, MA

7/10 - 6-11 DoD Contractor, Consulting Psychologist, Clinical Research Management (CRM)

7/11 - 6/14 Director, Social Cognitive, and Affective Neuroscience (SCAN) Laboratory, McLean Hospital, Belmont, MA

7/14- Director, Social, Cognitive, and Affective Neuroscience (SCAN) Laboratory, University of Arizona, Tucson, AZ

3/16 -12/18 ORISE Knowledge Preservation Fellow; Walter Reed Army Institute of Research, Silver Spring, MD

1/19- Senior Statistical Analyst: TechWerks, LLC; Walter Reed Army Institute of Research, Silver Spring, MD

Military Positions

11/01 - 8/02 First Lieutenant, Medical Service Corps, United States Army Reserve (USAR)

8/02 - 7/05 Captain, Medical Service Corps, United States Army-Active Regular Army (RA)

8/05 - 10/07 Major, Medical Service Corps, United States Army-Active Regular Army (RA)
 10/07 - 7/12 Major, Medical Service Corps, United States Army Reserve (USAR)
 7/12 – 9/19 Lieutenant Colonel, Medical Service Corps, United States Army Reserve (USAR)
 3/16 - Deputy Consultant to the Surgeon General of the Army (SGA) for 71F Research
 Psychology, US Army Reserves
 9/19- Colonel, Medical Service Corps, United States Army Reserve (USAR)

HONORS AND AWARDS

1990 Outstanding Senior Honors Thesis in Psychology, University of New Mexico
 1990-1995 Maxey Scholarship in Psychology, Texas Tech University
 2001 Rennick Research Award, Co-Author, International Neuropsychological Society
 2002 Honor Graduate, AMEDD Officer Basic Course, U.S. Army Medical Department Center and School
 2002 Lynch Leadership Award Nominee, AMEDD Officer Basic Course, U.S. Army Medical Department Center and School
 2003 Outstanding Research Presentation Award, 2003 Force Health Protection Conference, U.S. Army Center for Health Promotion and Preventive Medicine
 2003 Who's Who in America
 2004 Who's Who in Medicine and Healthcare
 2005 Edward L. Buescher Award for Excellence in Research by a Young Scientist, Walter Reed Army Institute of Research (WRAIR) Association
 2009 Merit Poster Award, International Neuropsychological Society
 2009 Outstanding Research Presentation Award, 2009 Force Health Protection Conference, U.S. Army Center for Health Promotion and Preventive Medicine
 2010 Best Paper Award, Neuroscience, 27th U.S. Army Science Conference
 2011 Published paper included in *Best of Sleep Medicine 2011*
 2011 Blue Ribbon Finalist, 2011 Top Poster Award in Clinical and Translational Research, Society of Biological Psychiatry
 2012 Defense Advanced Research Projects Agency (DARPA) Young Faculty Award in Neuroscience
 2014 Blue Ribbon Finalist, 2014 Top Poster Award in Basic Neuroscience, Society of Biological Psychiatry
 2014 Harvard Medical School Excellence in Mentoring Award Nominee
 2014 AASM Young Investigator Award (co-author), Honorable Mention, American Academy of Sleep Medicine
 2017 Trainee Abstract Merit Award (mentor/co-author), Sleep Research Society
 2018 Trainee Abstract Merit Award (mentor/co-author), Sleep Research Society.
 2020 Nelson Butters Award for Best Paper by a Postdoctoral Fellow (mentor/co-author), International Neuropsychological Society

SERVICE/OUTREACH

Local/State Service/Outreach

2003 Scientific Review Committee, Walter Reed Army Institute of Research (WRAIR), Silver Spring, MD

2005	Scientific Review Committee, Walter Reed Army Institute of Research (WRAIR), Silver Spring, MD
2012-14	McLean Hospital Research Committee, McLean Hospital, Belmont, MA
2016	House Ad Hoc Committee on Treatment of Traumatic Brain Injuries and Benefits of Hyperbaric Oxygen Therapy, Arizona House of Representatives

National/International Service/Outreach

2004	University of Alabama, Clinical Nutrition Research Center (UAB CNRC) Pilot/Feasibility Study Program Review Committee
2006	U.S. Small Business Administration, Small Business Technology Transfer (STTR) Program Review Committee
2006	Cognitive Performance Assessment Program Area Steering Committee, U.S. Army Military Operational Medicine Research Program Funding Panel
2006	External Member, Doctoral Thesis Committee, Belinda J. Liddle, Ph.D., University of Sydney, Australia
2007	Cognitive Performance Assessment Program Area Steering Committee, U.S. Army Military Operational Medicine Research Program Funding Panel
2008	United States Army Medical Research and Materiel Command (USAMRMC) Congressionally Directed Medical Research Programs (CDMRP) Extramural Grant Review Panel
2008-2011	Long-Distance High School Research Mentor, Christina Song, NY
2009	NIH-CSR Brain Disorders and Clinical Neuroscience N02 Member Study Conflict Section Review Panel
2009	Sleep Physiology and Fatigue Interventions Program Area Steering Committee, U.S. Army Military Operational Medicine Research Program
2009	Scotland, UK, Biomedical and Therapeutic Research Committee, Grant Reviewer
2010	Canada, Social Sciences and Humanities Research Council of Canada, Grant Reviewer
2011	National Science Foundation (NSF) Grant Reviewer
2011-	National Network of Depression Centers (NNDC), Military Task Group
2011	Israel, Israel Science Foundation (ISF), Grant Reviewer
2011	Scientific Review Committee, US Army Institute of Environmental Medicine (USARIEM)
2012	National Science Foundation (NSF) Grant Reviewer
2012-	American Academy of Sleep Medicine, Member
2013	Israel, Israel Science Foundation (ISF), Grant Reviewer
2014-	Organization for Human Brain Mapping, Member
2015-	Human Affectome Project Advisory Board Member
2016-	Sleep Research Society Member
2017-2018	External Reviewer, Doctoral Thesis Reviewer, Kalina R. Rossa, Queensland University of Technology, Australia.
2018	Marsden Fund Council Grant Proposal Referee, Royal Society Te Aparangi, New Zealand.
2018	External Faculty Promotion Dossier Reviewer, Oregon Health & Science University
2018-2020	Long-Distance High School Research Mentor, Taleen Postian, Byram Hills HS, NY
2019	External Reviewer, Doctoral Thesis Reviewer, William Ryan McMahon, Monash University, Australia.
2020-	Long-Distance High School Research Mentor, Shivani Desai, Phoenix, AZ

Departmental Committees

2006	Chair, Undergraduate Honors Thesis Committee, Jessica Richards, Department of Psychology, University of Maryland, Baltimore County, MD
2012-	Member, Research Committee, McLean Hospital, Belmont, MA
2014	Psychiatry Senior Research Manager Candidate Search Committee, Department of Psychiatry, University of Arizona, Tucson, AZ
2014-2015	Member, Faculty Search Committee, Department of Psychology, University of Arizona, Tucson, AZ.
2014-2016	Member, Comprehensive Examination Committee, Natalie Bryant, Department of Psychology, University of Arizona, Tucson, AZ
2014-2015	Chair/Research Faculty Mentor, Undergraduate Honors Thesis Committee, Haley Kent, Department of Biochemistry, University of Arizona, Tucson, AZ
2014-	Member, Psychiatry Research Investigator Committee, Department of Psychiatry, University of Arizona, Tucson, AZ.
2015	Member, Dissertation Committee, Ryan S. Smith, Ph.D., Department of Psychology, University of Arizona, Tucson AZ.
2015	Imaging Excellence Cluster Hire Search Committee, Department of Medical Imaging, University of Arizona, Tucson, AZ
2015-	Member, Mentoring Committee, Department of Psychiatry, University of Arizona, Tucson, AZ
2016	Member, Chief of Neuroradiology Faculty Search Committee, Department of Medical Imaging, University of Arizona, Tucson, AZ
2016-2017	Member, Dissertation Committee, Brian Arizmendi, Department of Psychology, University of Arizona, Tucson, AZ
2016-2017	Member, Masters Thesis Committee, Saren Seeley, Department of Psychology, University of Arizona, Tucson, AZ
2016-2017	Member, Masters Thesis Committee, Mairead McConnell, Department of Psychology, University of Arizona, Tucson, AZ
2016-2018	Member, Masters Thesis Committee, John Vanuk, Department of Psychology, University of Arizona, Tucson, AZ
2016-2017	Faculty Advisor, Undergraduate Honor Thesis Committee, Matthew Nettles, Neuroscience/Cognitive Science, University of Arizona, Tucson, AZ
2016-	Scientific Review Committee, Department of Psychiatry, University of Arizona, Tucson, AZ
2017-2018	Faculty Advisor, Undergraduate Honors Thesis Committee, Debby Waugaman, Psychology, University of Arizona, Tucson, AZ
2017-2018	Faculty Advisor, Undergraduate Honors Thesis Committee, Jun Lee, Department of Psychology, University of Arizona, Tucson, AZ
2017-	Chair, Psychiatry Research Committee, Department of Psychiatry, University of Arizona, Tucson, AZ
2017-	Member, Promotion and Tenure Committee, Department of Psychiatry, University of Arizona, Tucson, AZ
2019	Member, Comprehensive Examination Committee, Ji-Soo Kim, Department of Psychology, University of Arizona, Tucson, AZ
2019	Member, Comprehensive Examination Committee, John Vanuk, Department of Psychology, University of Arizona, Tucson, AZ
2019-2020	Member, Masters Thesis Committee, Veronica Kraft, Department of Psychology, University of Arizona, Tucson, AZ

2019-2020	Faculty Advisor, Undergraduate Honors Thesis Committee, Giovanna Gutierrez, Department of Neuroscience and Cognitive Science, University of Arizona, Tucson, AZ
2019-2020	Faculty Advisor, Undergraduate Honors Thesis Committee, Corinne Meinhausen, Department of Neuroscience and Cognitive Science, University of Arizona, Tucson, AZ
2019-2020	Faculty Advisor, Undergraduate Honors Thesis Committee, Jared Kleiner, Department of Neuroscience and Cognitive Science, University of Arizona, Tucson, AZ
2020	Member, Comprehensive Examination Committee, Sophie Pinkston, Department of Psychology, University of Arizona, Tucson, AZ
2020-	Co-Chair, Dissertation Committee, John Vanuk, Department of Psychology, University of Arizona, Tucson, AZ.
2020-	Member, Comprehensive Examination Committee, Veronica Kraft, Department of Psychology, University of Arizona, Tucson, AZ
2021	Chair, Research Task Force for College of Medicine Strategic Plan, Department of Psychiatry, University of Arizona, Tucson, AZ

University Committees/Service

2014	Ad Hoc Member, Interview Committee for Defense and Security Research Institute Director Position, University of Arizona, Tucson, AZ.
2014-2018	Member, Mechanisms of Emotion, Social Relationships, and Health Interdisciplinary Developing Research Program, Clinical and Translational Science Institute, BIO5, University of Arizona, Tucson, AZ
2015	Vice President's Executive Committee for Defense and Security Strategic Planning, University of Arizona, Tucson, AZ
2015-	MRI Operations Committee, University of Arizona, Tucson, AZ
2016	Faculty Mentor, Undergraduate Biology Research Program (UBRP), University of Arizona, Tucson, AZ
2016	Faculty Mentor, Border Latino & American Indian Summer Exposure to Research (BLAISER) Program, University of Arizona, Tucson, AZ
2016	Faculty Mentor, Medical Student Research Committee (MSRC) Program, University of Arizona College of Medicine, Tucson, AZ
2018	Administrative Review Committee: Psychiatry Department Chair
2019	Reviewer, Psychology Department Faculty Pilot Grant Program
2019	Reviewer, Arizona Alzheimer's Consortium
2019-	3T Faculty Advisory Committee, University of Arizona, Tucson, AZ
2019	Faculty Mentor, Steps 2 STEM High School Research Internship Program, Tucson, AZ
2020	Sleep & Circadian Science Center Construction Manager at Risk Search Committee, Tucson, AZ
2020-	Sleep & Circadian Science Center Oversight Committee, Tucson, AZ.

Editorial Board Membership

2009-2018	Editorial Board Member, International Journal of Eating Disorders
2012-	Editorial Board Member, Dataset Papers in Neuroscience
2012-	Editorial Board Member, Dataset Papers in Psychiatry
2012-	Editor, Journal of Sleep Disorders: Treatment and Care

Ad Hoc Journal Reviewer (106 Journals)

2001-2012	Reviewer, Psychological Reports
2001-2012	Reviewer, Perceptual and Motor Skills
2002	Reviewer, American Journal of Psychiatry
2002-2013	Reviewer, Biological Psychiatry
2003	Reviewer, Clinical Neurology and Neurosurgery
2004-2016	Reviewer, NeuroImage
2004-2006	Reviewer, Neuropsychologia
2004-2016	Reviewer, Journal of Neuroscience
2004	Reviewer, Consciousness and Cognition
2005	Reviewer, Experimental Brain Research
2005	Reviewer, Schizophrenia Research
2005-2012	Reviewer, Archives of General Psychiatry
2005, 2021	Reviewer, Behavioral Brain Research
2005-2021	Reviewer, Human Brain Mapping
2005-2013	Reviewer, Psychiatry Research: Neuroimaging
2006	Reviewer, Journal of Abnormal Psychology
2006	Reviewer, Psychopharmacology
2006	Reviewer, Developmental Science
2006	Reviewer, Acta Psychologica
2006, 2015	Reviewer, Neuroscience Letters
2006-2020	Reviewer, Journal of Sleep Research
2006-2016	Reviewer, Physiology and Behavior
2006-2021	Reviewer, SLEEP
2007	Reviewer, Journal of Clinical and Experimental Neuropsychology
2008	Reviewer, European Journal of Child and Adolescent Psychiatry
2008	Reviewer, Judgment and Decision Making
2008-2010	Reviewer, Aviation, Space, & Environmental Medicine
2008	Reviewer, Journal of Psychophysiology
2008	Reviewer, Brazilian Journal of Medical and Biological Research
2008	Reviewer, The Harvard Undergraduate Research Journal
2008	Reviewer, Bipolar Disorders
2008-2013	Reviewer, Chronobiology International
2008	Reviewer, International Journal of Obesity
2009	Reviewer, European Journal of Neuroscience
2009-2018	Reviewer, International Journal of Eating Disorders
2009	Reviewer, Psychophysiology
2009	Reviewer, Traumatology
2009	Reviewer, Clinical Medicine: Therapeutics
2009	Reviewer, Acta Pharmacologica Sinica
2009	Reviewer, Collegium Antropologicum
2009	Reviewer, Journal of Psychopharmacology
2009-2014	Reviewer, Obesity
2009	Reviewer, Scientific Research and Essays
2009	Reviewer, Child Development Perspectives
2009-2010	Reviewer, Personality and Individual Differences

2009-2010	Reviewer, Noise and Health
2009-2010	Reviewer, Sleep Medicine
2010	Reviewer, Nature and Science of Sleep
2010	Reviewer, Psychiatry and Clinical Neurosciences
2010	Reviewer, Learning and Individual Differences
2010	Reviewer, Cognitive, Affective, and Behavioral Neuroscience
2010	Reviewer, BMC Medical Research Methodology
2010-2011	Reviewer, Journal of Adolescence
2010-2012	Reviewer, Brain Research
2011	Reviewer, Brain
2011-2019	Reviewer, Social Cognitive and Affective Neuroscience
2011	Reviewer, Journal of Traumatic Stress
2011	Reviewer, Social Neuroscience
2011-2014	Reviewer, Brain and Cognition
2011	Reviewer, Frontiers in Neuroscience
2011-2012	Reviewer, Sleep Medicine Reviews
2012	Reviewer, Journal of Experimental Psychology: General
2012	Reviewer, Ergonomics
2012-2017	Reviewer, Behavioral Sleep Medicine
2012	Reviewer, Neuropsychology
2012	Reviewer, Emotion
2012	Reviewer, JAMA
2012	Reviewer, BMC Neuroscience
2012-2015	Reviewer, Cognition and Emotion
2012	Reviewer, Journal of Behavioral Decision Making
2012	Reviewer, Psychosomatic Medicine
2012-2021	Reviewer, PLoS One
2012	Reviewer, American Journal of Critical Care
2012-2014	Reviewer, Journal of Sleep Disorders: Treatment and Care
2013	Reviewer, Experimental Psychology
2013	Reviewer, Clinical Interventions in Aging
2013	Reviewer, Frontiers in Psychology
2013	Reviewer, Brain Structure and Function
2013	Reviewer, Appetite
2013-2020	Reviewer, JAMA Psychiatry
2014	Reviewer, Acta Psychologica
2014	Reviewer, Neurology
2014	Reviewer, Applied Neuropsychology: Child
2014-2016	Reviewer, Journal of Applied Psychology
2015	Reviewer, Early Childhood Research Quarterly
2015	Reviewer, Behavioral Neuroscience
2015-2021	Reviewer, Scientific Reports
2016-2018	Reviewer, Neuroscience & Biobehavioral Reviews
2016	Reviewer, Psychological Science
2016-2021	Reviewer, Medicine & Science in Sports and Exercise
2016	Reviewer, Archives of Clinical Neuropsychology
2016	Reviewer, Advances in Cognitive Psychology
2017	Reviewer, Data in Brief

2017	Reviewer, Neuroscience
2017-2018	Reviewer, Sleep Health
2017	Reviewer, Journal of Experimental Social Psychology
2017-2018	Reviewer, Neural Plasticity
2018	Reviewer, NeuroImage: Clinical
2018	Reviewer, Journal of Psychiatric Research
2018	Reviewer, Journal of Clinical Sleep Medicine
2019	Reviewer, Harvard Review of Psychiatry
2019	Reviewer, Progress in Brain Research
2020	Reviewer, Journal of Experimental Psychology: Learning, Memory, and Cognition
2020-2021	Reviewer, Psychiatry Research
2021	Reviewer, Health Promotion international
2021	Reviewer, Military Behavioral Health

PUBLICATIONS/CREATIVE ACTIVITY

Refereed Journal Articles

1. **Killgore WD.** The Affect Grid: a moderately valid, nonspecific measure of pleasure and arousal. Psychol Rep. 83(2):639-42, 1998.
2. **Killgore WD.** Empirically derived factor indices for the Beck Depression Inventory. Psychol Rep. 84(3 Pt 1):1005-13, 1999.
3. **Killgore WD.** Affective valence and arousal in self-rated depression and anxiety. Percept Mot Skills. 89(1):301-4, 1999.
4. **Killgore WD, Adams RL.** Prediction of Boston Naming Test performance from vocabulary scores: preliminary guidelines for interpretation. Percept Mot Skills. 89(1):327-37, 1999.
5. **Killgore WD, Gangestad SW.** Sex differences in asymmetrically perceiving the intensity of facial expressions. Percept Mot Skills. 89(1):311-4, 1999.
6. **Killgore WD.** The visual analogue mood scale: can a single-item scale accurately classify depressive mood state? Psychol Rep. 85(3 Pt 2):1238-43, 1999.
7. **Killgore WD, DellaPietra L, Casasanto DJ.** Hemispheric laterality and self-rated personality traits. Percept Mot Skills. 89(3 Pt 1):994-6, 1999.
8. **Killgore WD, Glosser G, Casasanto DJ, French JA, Alsop DC, Detre JA.** Functional MRI and the Wada test provide complementary information for predicting post-operative seizure control. Seizure. 8(8):450-5, 1999.
9. **Killgore WD.** Evidence for a third factor on the Positive and Negative Affect Schedule in a college student sample. Percept Mot Skills. 90(1):147-52, 2000.

10. **Killgore WD**, Dellapietra L. Item response biases on the logical memory delayed recognition subtest of the Wechsler Memory Scale-III. *Psychol Rep.* 86(3 Pt 1):851-7, 2000.
11. **Killgore WD**, Casasanto DJ, Yurgelun-Todd DA, Maldjian JA, Detre JA. Functional activation of the left amygdala and hippocampus during associative encoding. *Neuroreport.* 11(10):2259-63, 2000.
12. Yurgelun-Todd DA, Gruber SA, Kanayama G, **Killgore WD**, Baird AA, Young AD. fMRI during affect discrimination in bipolar affective disorder. *Bipolar Disord.* 2(3 Pt 2):237-48, 2000.
13. **Killgore WD**. Sex differences in identifying the facial affect of normal and mirror-reversed faces. *Percept Mot Skills.* 91(2):525-30, 2000.
14. **Killgore WD**, DellaPietra L. Using the WMS-III to detect malingering: empirical validation of the rarely missed index (RMI). *J Clin Exp Neuropsychol.* 22(6):761-71, 2000.
15. **Killgore WD**. Academic and research interest in several approaches to psychotherapy: a computerized search of literature in the past 16 years. *Psychol Rep.* 87(3 Pt 1):717-20, 2000.
16. Maldjian JA, Detre JA, **Killgore WD**, Judy K, Alsop D, Grossman M, Glosser G. Neuropsychologic performance after resection of an activation cluster involved in cognitive memory function. *AJR Am J Roentgenol.* 176(2):541-4, 2001.
17. **Killgore WD**, Oki M, Yurgelun-Todd DA. Sex-specific developmental changes in amygdala responses to affective faces. *Neuroreport.* 12(2):427-33, 2001.
18. **Killgore WD**, Yurgelun-Todd DA. Sex differences in amygdala activation during the perception of facial affect. *Neuroreport.* 12(11):2543-7, 2001.
19. Casasanto DJ, **Killgore WD**, Maldjian JA, Glosser G, Alsop DC, Cooke AM, Grossman M, Detre JA. Neural correlates of successful and unsuccessful verbal memory encoding. *Brain Lang.* 80(3):287-95, 2002.
20. **Killgore WD**. Laterality of lesions and trait-anxiety on working memory performance. *Percept Mot Skills.* 94(2):551-8, 2002.
21. **Killgore WD**, Cupp DW. Mood and sex of participant in perception of happy faces. *Percept Mot Skills.* 95(1):279-88, 2002.
22. Yurgelun-Todd DA, **Killgore WD**, Young AD. Sex differences in cerebral tissue volume and cognitive performance during adolescence. *Psychol Rep.* 91(3 Pt 1):743-57, 2002.
23. Yurgelun-Todd DA, **Killgore WD**, Cintron CB. Cognitive correlates of medial temporal lobe development across adolescence: a magnetic resonance imaging study. *Percept Mot Skills.* 96(1):3-17, 2003.

24. **Killgore WD**, Young AD, Femia LA, Bogorodzki P, Rogowska J, Yurgelun-Todd DA. Cortical and limbic activation during viewing of high- versus low-calorie foods. *Neuroimage*. 19(4):1381-94, 2003.
25. **Killgore WD**, Yurgelun-Todd DA. Activation of the amygdala and anterior cingulate during nonconscious processing of sad versus happy faces. *Neuroimage*. 21(4):1215-23, 2004.
26. **Killgore WD**, Yurgelun-Todd DA. Sex-related developmental differences in the lateralized activation of the prefrontal cortex and amygdala during perception of facial affect. *Percept Mot Skills*. 99(2):371-91, 2004.
27. **Killgore WD**, Glahn DC, Casasanto DJ. Development and Validation of the Design Organization Test (DOT): a rapid screening instrument for assessing visuospatial ability. *J Clin Exp Neuropsychol*. 27(4):449-59, 2005.
28. **Killgore WD**, Yurgelun-Todd DA. Body mass predicts orbitofrontal activity during visual presentations of high-calorie foods. *Neuroreport*. 16(8):859-63, 2005.
29. Wesensten NJ, **Killgore WD**, Balkin TJ. Performance and alertness effects of caffeine, dextroamphetamine, and modafinil during sleep deprivation. *J Sleep Res*. 14(3):255-66, 2005.
30. **Killgore WD**, Yurgelun-Todd DA. Social anxiety predicts amygdala activation in adolescents viewing fearful faces. *Neuroreport*. 16(15):1671-5, 2005.
31. **Killgore WD**, Yurgelun-Todd DA. Developmental changes in the functional brain responses of adolescents to images of high and low-calorie foods. *Dev Psychobiol*. 47(4):377-97, 2005.
32. Kahn-Greene ET, Lipizzi EL, Conrad AK, Kamimori GH, **Killgore WD**. Sleep deprivation adversely affects interpersonal responses to frustration. *Pers Individ Dif*. 41(8):1433-1443, 2006.
33. McBride SA, Balkin TJ, Kamimori GH, **Killgore WD**. Olfactory decrements as a function of two nights of sleep deprivation. *J Sens Stud*. 24(4):456-63, 2006.
34. **Killgore WD**, Yurgelun-Todd DA. Ventromedial prefrontal activity correlates with depressed mood in adolescent children. *Neuroreport*. 17(2):167-71, 2006.
35. **Killgore WD**, Vo AH, Castro CA, Hoge CW. Assessing risk propensity in American soldiers: preliminary reliability and validity of the Evaluation of Risks (EVAR) scale--English version. *Mil Med*. 171(3):233-9, 2006.
36. **Killgore WD**, Balkin TJ, Wesensten NJ. Impaired decision making following 49 h of sleep deprivation. *J Sleep Res*. 15(1):7-13, 2006.
37. **Killgore WD**, Stetz MC, Castro CA, Hoge CW. The effects of prior combat experience on the expression of somatic and affective symptoms in deploying soldiers. *J Psychosom Res*. 60(4):379-85, 2006.

38. **Killgore WD**, McBride SA, Killgore DB, Balkin TJ. The effects of caffeine, dextroamphetamine, and modafinil on humor appreciation during sleep deprivation. *Sleep*. 29(6):841-7, 2006.
39. **Killgore WD**, McBride SA. Odor identification accuracy declines following 24 h of sleep deprivation. *J Sleep Res*. 15(2):111-6, 2006.
40. **Killgore WD**, Yurgelun-Todd DA. Affect modulates appetite-related brain activity to images of food. *Int J Eat Disord*. 39(5):357-63, 2006.
41. Kendall AP, Kautz MA, Russo MB, **Killgore WD**. Effects of sleep deprivation on lateral visual attention. *Int J Neurosci*. 116(10):1125-38, 2006.
42. Yurgelun-Todd DA, **Killgore WD**. Fear-related activity in the prefrontal cortex increases with age during adolescence: a preliminary fMRI study. *Neurosci Lett*. 406(3):194-9, 2006.
43. **Killgore WD**, Killgore DB, Ganesan G, Krugler AL, Kamimori GH. Trait-anger enhances effects of caffeine on psychomotor vigilance performance. *Percept Mot Skills*. 103(3):883-6, 2006.
44. **Killgore WD**, Yurgelun-Todd DA. Unconscious processing of facial affect in children and adolescents. *Soc Neurosci*. 2(1):28-47, 2007.
45. **Killgore WD**, Yurgelun-Todd DA. The right-hemisphere and valence hypotheses: could they both be right (and sometimes left)? *Soc Cogn Affect Neurosci*. 2(3):240-50, 2007.
46. **Killgore WD**, Killgore DB. Morningness-eveningness correlates with verbal ability in women but not men. *Percept Mot Skills*. 104(1):335-8, 2007.
47. **Killgore WD**, Killgore DB, Day LM, Li C, Kamimori GH, Balkin TJ. The effects of 53 hours of sleep deprivation on moral judgment. *Sleep*. 30(3):345-52, 2007.
48. Rosso IM, **Killgore WD**, Cintron CM, Gruber SA, Tohen M, Yurgelun-Todd DA. Reduced amygdala volumes in first-episode bipolar disorder and correlation with cerebral white matter. *Biol Psychiatry*. 61(6):743-9, 2007.
49. Kahn-Greene ET, Killgore DB, Kamimori GH, Balkin TJ, **Killgore WD**. The effects of sleep deprivation on symptoms of psychopathology in healthy adults. *Sleep Med*. 8(3):215-21, 2007.
50. **Killgore WD**. Effects of sleep deprivation and morningness-eveningness traits on risk-taking. *Psychol Rep*. 100(2):613-26, 2007.
51. **Killgore WD**, Gruber SA, Yurgelun-Todd DA. Depressed mood and lateralized prefrontal activity during a Stroop task in adolescent children. *Neurosci Lett*. 416(1):43-8, 2007.
52. **Killgore WD**, Yurgelun-Todd DA. Positive affect modulates activity in the visual cortex to images of high calorie foods. *Int J Neurosci*. 117(5):643-53, 2007.

53. Vo AH, Satori R, Jabbari B, Green J, **Killgore WD**, Labutta R, Campbell WW. Botulinum toxin type-a in the prevention of migraine: a double-blind controlled trial. *Aviat Space Environ Med.* 78(5 Suppl):B113-8, 2007.
54. **Killgore WD**, Yurgelun-Todd DA. Neural correlates of emotional intelligence in adolescent children. *Cogn Affect Behav Neurosci.* 7(2):140-51, 2007.
55. **Killgore WD**, Kendall AP, Richards JM, McBride SA. Lack of degradation in visuospatial perception of line orientation after one night of sleep loss. *Percept Mot Skills.* 105(1):276-86, 2007.
56. **Killgore WD**, Lipizzi EL, Kamimori GH, Balkin TJ. Caffeine effects on risky decision making after 75 hours of sleep deprivation. *Aviat Space Environ Med.* 78(10):957-62, 2007.
57. **Killgore WD**, Richards JM, Killgore DB, Kamimori GH, Balkin TJ. The trait of Introversion-Extraversion predicts vulnerability to sleep deprivation. *J Sleep Res.* 16(4):354-63, 2007.
58. **Killgore WD**, Kahn-Green ET, Killgore DB, Kamimori GH, Balkin TJ. Effects of acute caffeine withdrawal on Short Category Test performance in sleep-deprived individuals. *Percept Mot Skills.* 105(3 pt.2):1265-74, 2007.
59. **Killgore WD**, Killgore DB, McBride SA, Kamimori GH, Balkin TJ. Odor identification ability predicts changes in symptoms of psychopathology following 56 hours of sleep deprivation. *J Sensory Stud.* 23(1):35-51, 2008.
60. **Killgore WD**, Rupp TL, Grugle NL, Reichardt RM, Lipizzi EL, Balkin TJ. Effects of dextroamphetamine, caffeine and modafinil on psychomotor vigilance test performance after 44 h of continuous wakefulness. *J Sleep Res.* 17(3):309-21, 2008.
61. Huck NO, McBride SA, Kendall AP, Grugle NL, **Killgore WD**. The effects of modafinil, caffeine, and dextroamphetamine on judgments of simple versus complex emotional expressions following sleep deprivation. *Int. J Neuroscience.* 118(4):487-502, 2008.
62. **Killgore WD**, Kahn-Greene ET, Lipizzi EL, Newman RA, Kamimori GH, Balkin TJ. Sleep deprivation reduces perceived emotional intelligence and constructive thinking skills. *Sleep Med.* 9(5):517-26, 2008.
63. **Killgore WD**, Grugle NL, Killgore DB, Leavitt BP, Watlington GI, McNair S, Balkin TJ. Restoration of risk-propensity during sleep deprivation: caffeine, dextroamphetamine, and modafinil. *Aviat Space Environ Med.* 79(9):867-74, 2008.
64. **Killgore WD**, Muckle AE, Grugle NL, Killgore DB, Balkin TJ. Sex differences in cognitive estimation during sleep deprivation: effects of stimulant countermeasures. *Int J Neurosci.* 118(11):1547-57, 2008.
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66. **Killgore WD**, Gruber SA, Yurgelun-Todd DA. Abnormal corticostriatal activity during fear perception in bipolar disorder. *Neuroreport*. 19(15):1523-7, 2008.
67. **Killgore WD**, McBride SA, Killgore DB, Balkin TJ, Kamimori GH. Baseline odor identification ability predicts degradation of psychomotor vigilance during 77 hours of sleep deprivation. *Int. J Neurosci*. 118(9):1207-1225, 2008.
68. **Killgore WD**, Rosso HM, Gruber SA, Yurgelun-Todd DA. Amygdala volume and verbal memory performance in schizophrenia and bipolar disorder. *Cogn Behav Neur*. 22(1):28-37, 2009.
69. **Killgore WD**, Kahn-Greene ET, Grugle NL, Killgore DB, Balkin TJ. Sustaining executive functions during sleep deprivation: A comparison of caffeine, dextroamphetamine, and modafinil. *Sleep*. 32(2):205-16, 2009.
70. **Killgore WD**, Grugle NL, Reichardt RM, Killgore DB, Balkin TJ. Executive functions and the ability to sustain vigilance during sleep loss. *Aviat Space Environ Med*. 80(2):81-7, 2009.
71. Picchioni, D, **Killgore, WD**, Braun, AR, & Balkin, TJ. Positron emission tomography correlates of EEG microarchitecture waveforms during non-REM sleep. *Int J Neurosci*. 119: 2074-2099, 2009.
72. **Killgore, WD**, Lipizzi, EL, Grugle, NL, Killgore, DB, & Balkin, TJ. Handedness correlates with actigraphically measured sleep in a controlled environment. *Percept Mot Skills*. 109: 395-400, 2009.
73. **Killgore, WD**, Killgore, DB, Grugle, NL, & Balkin, TJ. Odor identification predicts executive function deficits during sleep deprivation. *Int J Neurosci*, 120: 328-334, 2010.
74. **Killgore, WD**, Ross, AJ, Kamiya, T, Kawada, Y, Renshaw, PF, & Yurgelun-Todd, DA. Citicoline affects appetite and cortico-limbic responses to images of high calorie foods. *Int J Eat Disord*. 43: 6-13, 2010.
75. **Killgore, WD**, & Yurgelun-Todd, DA. Cerebral correlates of amygdala responses during non-conscious perception of facial affect in adolescent and pre-adolescent children. *Cogn Neurosci*, 1: 33-43, 2010.
76. **Killgore, WD**, & Yurgelun-Todd, DA. Sex differences in cerebral responses to images of high vs low calorie food. *Neuroreport*, 21: 354-358, 2010.
77. **Killgore, WD**, Grugle, NL, Killgore, DB, & Balkin, TJ. Sex differences in self-reported risk-taking propensity on the Evaluation of Risks scale. *Percept Mot Skills*, 106: 693-700, 2010.
78. **Killgore, WD**, Kelley, AM, & Balkin, TJ. So you think you're bulletproof: Development and validation of the Invincibility Belief Index. *Mil Med*, 175: 499-508, 2010.
79. **Killgore, WD**, Castro, CA, & Hoge, CW. Preliminary Normative Data for the Evaluation of Risks Scale—Bubble Sheet Version (EVAR-B) for Large Scale Surveys of Returning Combat

Veterans. *Mil Med*, 175: 725-731, 2010.

80. Britton, JC, Rauch, SL, Rosso, IM, **Killgore, WD**, Price, LM, Ragan, J, Chosak, A, Hezel, D, Pine, DS, Leibenluft, E, Pauls, DL, Jenike, MA, Stewart, SE. Cognitive inflexibility and frontal cortical activation in pediatric obsessive-compulsive disorder. *J Am Acad Child Adolesc Psychiatry*, 49: 944-953, 2010.
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85. **Killgore, WD**, Kamimori, GH, & Balkin, TJ. Caffeine protects against increased risk-taking propensity during severe sleep deprivation. *J Sleep Res* 20: 395-403, 2011.
86. Capaldi, VF, Guerrero, ML, & **Killgore, WD**. Sleep disruption among returning combat veterans from Iraq and Afghanistan. *Mil Med*, 176: 879-888, 2011.
87. **Killgore, WD**, Grugle, NL, & Balkin, TJ. Gambling when sleep deprived: Don't bet on stimulants. *Chronobiol Int*, 29: 43-54, 2012.
88. Gruber, SA, Dahlgren, MK, Sagar, KA, Gonenc, A, & **Killgore, WD**. Age of onset of marijuana use impacts inhibitory processing. *Neurosci Lett* 511(2):89-94, 2012.
89. **Killgore, WD**, Capaldi, VF, & Guerrero, ML. Nocturnal polysomnographic correlates of daytime sleepiness. *Psychol Rep*, 110(10), 63-72, 2012.
90. **Killgore, WD**, Weber, M, Schwab, ZJ, DelDonno, SR, Kipman, M, Weiner, MR, & Rauch, SL. Grey matter correlates of trait and ability models of emotional intelligence. *Neuroreport* 23, 551-555, 2012.
91. **Killgore, WD**, Schwab, ZJ, Kipman, M, DelDonno, SR, Weber, M. Voxel-based morphometric grey matter correlates of daytime sleepiness. *Neurosci Lett*, 518(1), 10-13, 2012.
92. **Killgore, WD**, Schwab, ZJ, & Weiner, MR. Self-reported nocturnal sleep duration is associated with next-day resting state functional connectivity. *Neuroreport*, 23, 741-745, 2012.

93. **Killgore, WD**, & Schwab, ZJ. Sex differences in the association between physical exercise and cognitive ability. *Perceptual and Motor Skills*, 115, 605-617, 2012.
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95. **Killgore, WD**, Schwab, ZJ, Weber, M, Kipman, M, DelDonno, SR, Weiner, MR, & Rauch, SL. Daytime sleepiness affects prefrontal regulation of food intake. *NeuroImage*, 71, 216-223, 2013.
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215. Smith, R, Taylor, S, Wang, S, Wilson, RC, Chuning, AE, Persich, MR, and **Killgore, WD**. Lower levels of directed exploration and reflective thinking are associated with greater anxiety and depression. *Frontiers in Psychiatry* (in press).

Book Chapters/Editorials/Other Published Articles

1. **Killgore, WD**. Cortical and limbic activation during visual perception of food. In Dube, L, Bechara, A, Dagher, A, Drewnowski, A, Lebel, J, James, P, & Yada, R. (Eds), *Obesity Prevention: The Role of Brain and Society on Individual Behavior*. Elsevier, Boston, 2010, pp. 57-71.
2. **Killgore, WD**. Asleep at the trigger: Warfighter judgment and decision-making during prolonged wakefulness. In Bartone, P. (Ed), *Applying Research Psychology to Improve Performance and Policy*. 2010, pp. 59-77.
3. **Killgore, WD**. Effects of Sleep Deprivation on Cognition. In Kerkhof, G. & Van Dongen, H. *Progress in Brain Research: Sleep and Cognition*. Elsevier, B.V. New York, 2010, pp. 105-129.
4. **Killgore, WD**. Caffeine and other alerting agents. In Thorpy, M. & Billiard, M. (Eds), *Sleepiness: Causes, Consequences, Disorders and Treatment*. Cambridge University Press, UK, 2011, pp. 430-443.
5. **Killgore WD**. Priorities and challenges for caffeine research: Energy drinks, PTSD, and withdrawal reversal. *The Experts Speak Column, J Caffeine Res*, 1, 11-12, 2011.
6. **Killgore, WD**. Odor identification ability predicts executive function deficits following sleep deprivation. In Lee-Chiong, T (Ed), *Best of Sleep Medicine 2011*. National Jewish Health, Denver CO, 2011, pp. 31-33.
7. **Killgore, WD**. Socio-emotional and neurocognitive effects of sleep loss. In Matthews, G. (Ed), *Handbook of Operator Fatigue*. Ashgate, London UK, 2012, pp. 227-243.
8. **Killgore, WD**. Sleepless nights and bulging waistlines (Editorial). *Journal of Sleep Disorders: Treatment and Care*, 1(1), doi: [10.4172/jsdtc.1000e101](https://doi.org/10.4172/jsdtc.1000e101), 2012.
9. **Killgore, WD**, & Penetar, DM. Sleep and Military Operational Effectiveness. In Kushida, CA (Ed), *The Encyclopedia of Sleep*, 2013, vol. 1, pp. 311-319. Academic Press, Waltham, MA.

10. **Killgore, WD**, Weiner, MR, & Schwab, ZJ. Sleep deprivation, personality, and psychopathic changes. In Kushida, CA (Ed), *The Encyclopedia of Sleep*, 2013, vol. 1, pp. 264-271. Academic Press, Waltham, MA.
11. Schoenberg, MR, & **Killgore, WD**. Psychologic and Psychiatric Assessment. In Kushida, CA (Ed), *The Encyclopedia of Sleep*, 2013, vol. 2, pp. 23-26. Academic Press, Waltham, MA.
12. **Killgore, WD**. Sleep loss and performance. In Moore, BA, & Barnett, JE (Eds), *Military Psychologists' Desk Reference*, 2013, pp. 241-246. Oxford University Press, New York.
13. Weber, M., & **Killgore, WD**. What are the emerging therapeutic uses of bright light therapy for neurological disorders? (Editorial). *Future Neurology*, 8, 495-497, 2013.
14. **Killgore WD** & Weber, M. Sleep deprivation and cognitive performance. In Bianchi, M (Ed), *Sleep Deprivation and Disease: Effects on the Body, Brain and Behavior*, 2014, pp. 209-229. Springer, New York.
15. **Killgore, WD**. Sleep deprivation and behavioral risk taking. In Watson, RR, *Sleep Modulation by Obesity, Diabetes, Age and Diet*, 2015, pp. 279-287. Elsevier, San Diego, CA.
16. **Killgore, WD**. Lighting the way to better sleep and health (Editorial). *Journal of Sleep Disorders: Treatment and Care*, 5:1, 2016.
17. Singh, P, & **Killgore WD**. Time dependent differences in gray matter volume post mild traumatic brain injury. *Neural Regeneration Research*, 11, 920-921, 2016.
18. Klimova, A, Singh, P, & **Killgore WD**. White matter abnormalities in MS: Advances in diffusion tensor imaging/tractography. In Watson, RR & Killgore, WD (Eds), *Nutrition and Lifestyle in Neurological Autoimmune Diseases: Multiple Sclerosis*. Elsevier, San Diego, CA, pp. 21-28, 2017.
19. Alkozei, A, Smith, R, & **Killgore, WD**. Grateful people are happy and healthy—But why? *Frontiers for Young Minds* (in press).
20. Smith, R, Alkozei, A, & **Killgore WD**. How do emotions work? *Frontiers for Young Minds* (in press).
21. Satterfield, BC, & **Killgore, WD**. Sleep loss, executive function, and decision-making. In Grandner, MG (Ed), *Sleep and Health*. Elsevier, San Diego (in press).
22. Satterfield, BC, Raikes, AC, & **Killgore, WD**. Sleep in social cognition and judgment. In Krizan, Z. (Ed), *Sleep, Personality, and Social Behavior*. Springer Nature (in press).
23. Raikes, AC, Athey, A, Alfonso-Miller, P, **Killgore, WD**, & Grandner, MA. Author response: Concussion assessment tools—A possible measure of sleepiness? *Sleep Medicine*, 66, 260-261, 2020.

24. **Killgore, WD**, Penetar, DM, & Capaldi, VF. Military operational effectiveness. In Kushida, CA (Ed), Encyclopedia of Sleep and Circadian Rhythms (2nd Edition). (in press).
25. **Killgore, WD**, & Doty, TJ. Personality and psychopathic changes. In Kushida, CA (Ed), Encyclopedia of Sleep and Circadian Rhythms (2nd Edition). (in press).
26. Doty, TJ, Shoenberg, MR, Dailey, NS, & **Killgore, WD**. Psychologic and psychiatric assessment. In Kushida, CA (Ed), Encyclopedia of Sleep and Circadian Rhythms (2nd Edition). (in press).
27. Cloonan, SA, Taylor, EC, Persich, MR, Dailey, NS, & **Killgore, WD**. Sleep and resilience during the COVID-19 pandemic. In Gabrielli, F, and Irtelli, F (Eds.). Anxiety, Uncertainty, and Resilience During the Pandemic Period – Anthropological and Psychological Perspectives. IntechOpen (in press).
28. Krupp, K, Madhivanan, P, **Killgore, WD**, Ruiz, JM, Carvajal, S, & Grandner, MA. Neurological manifestations in COVID-19: An unrecognized crisis in our elderly? (Commentary). Advances in Geriatric Medicine and Research (in press).

Books

1. Watson, RR, & **Killgore, WD** (Eds.). Nutrition and lifestyle in neurological autoimmune diseases: Multiple Sclerosis. Elsevier, San Diego, CA, 2017.

Published U.S. Government Technical Reports

1. **Killgore, WD**, Estrada, A, Rouse, T, Wildzunas, RM, Balkin, TJ. Sleep and performance measures in soldiers undergoing military relevant training. USAARL Report No. 2009-13. June, 2009.
2. Kelley, AM, **Killgore, WD**, Athy, JR, Dretsch, M. Risk propensity, risk perception, and sensation seeking in U.S. Army Soldiers: A preliminary study of a risk assessment battery. USAARL Report No. 2010-02. DTIC #: ADA511524. October, 2009.

CONFERENCES/SCHOLARLY PRESENTATIONS

Colloquia

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| 2000 | <i>The Neurobiology of Emotion in Children</i> , McLean Hospital, Belmont, MA [<i>Invited Lecture</i>] |
| 2001 | <i>The Neurobiology of Emotion in Children and Adolescents</i> , McLean Hospital, Belmont, MA [<i>Invited Lecture</i>] |

- 2002 Cortico-Limbic Activation in Adolescence and Adulthood, Youth Advocacy Project, Cape Cod, MA [Invited Lecture]
- 2008 Lecture on *Sleep Deprivation, Executive Function, and Resilience to Sleep Loss*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [Invited Lecture]
- 2008 Lecture on *The Role of Research Psychology in the Army*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [Invited Lecture]
- 2008 Lecture on *Combat Stress Control: Basic Battlemind Training*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [Invited Lecture]
- 2009 Lecture entitled *Evaluate a Casualty, Prevent Shock, and Prevent Cold Weather injuries*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [Invited Lecture]
- 2009 Lecture on *Combat Exposure and Sleep Deprivation Effects on Risky Decision-Making*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [Invited Lecture]
- 2009 Lecture on the *Sleep History and Readiness Predictor (SHARP)*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [Invited Lecture]
- 2009 Lecture on *The Use of Actigraphy for Measuring Sleep in Combat and Military Training*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [Invited Lecture]
- 2010 Lecture entitled *Casualty Evaluation*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [Invited Lecture]
- 2010 Lecture entitled *Combat Stress and Risk-Taking Behavior Following Deployment*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [Invited Lecture]
- 2010 Lecture entitled *Historical Perspectives on Combat Medicine at the Battle of Gettysburg*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [Invited Lecture]
- 2010 Lecture entitled *Sleep Loss, Stimulants, and Decision-Making*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [Invited Lecture]
- 2010 Lecture entitled *PTSD: New Insights from Brain Imaging*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [Invited Lecture]
- 2011 Lecture entitled *Effects of bright light therapy on sleep, cognition and brain function after mild traumatic brain injury*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [Invited Lecture]
- 2011 Lecture entitled *Laboratory Sciences and Research Psychology in the Army*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [Invited Lecture]
- 2011 Lecture entitled *Tools for Assessing Sleep in Military Settings*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [Invited Lecture]

- 2011 Lecture entitled *The Brain Basis of Emotional Trauma and Practical Issues in Supporting Victims of Trauma*, U.S. Department of Justice, United States Attorneys Office, Serving Victims of Crime Training Program, Holyoke, MA [*Invited Lecture*]
- 2011 Lecture entitled *The Brain Altering Effects of Traumatic Experiences*; 105th Reinforcement Training Unit (RTU), U.S. Army Reserve Center, Boston, MA [*Invited Lecture*]
- 2012 Lecture entitled *Sleep Loss, Caffeine, and Military Performance*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [*Invited Lecture*]
- 2012 Lecture entitled *Using Light Therapy to Treat Sleep Disturbance Following Concussion*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [*Invited Lecture*]
- 2013 Lecture entitled *Brain Responses to Food: What you See Could Make you Fat*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [*Invited Lecture*]
- 2013 Lecture entitled *Predicting Resilience Against Sleep Loss*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [*Invited Lecture*]
- 2014 Lecture entitled *Get Some Shut-Eye or Get Fat: Sleep Loss Affects Brain Responses to Food*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [*Invited Lecture*]
- 2014 Lecture entitled *Emotional Intelligence: Developing a Training Program*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [*Invited Lecture*]
- 2014 Lecture entitled *Supporting Cognitive and Emotional Health in Warfighters*. Presented to the Senior Vice President for the Senior Vice President for Health Sciences and Dean of the Medical School, University of Arizona, Tucson, AZ [*Invited Lecture*]
- 2015 Lecture entitled *Understanding the Effects of Mild TBI (Concussion) on the Brain*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [*Invited Lecture*]
- 2015 Presentation entitled *Superhuman Brains: The Neurocircuitry that Underlies the Ability to Resist Sleep Deprivation*. Presented at the Neuroscience Datablitz, University of Arizona, Tucson, AZ [*Invited Lecture*]
- 2015 Presentation entitled: *SCAN Lab Traumatic Stress Study*. Presented at the Tucson Veteran Center, Tucson AZ [*Invited Lecture*]
- 2016 Presentation entitled: *SCAN Lab Overview*. Presented at the University of Arizona 2016 Sleep workshop, Tucson, AZ [*Invited Lecture*]
- 2016 Lecture entitled *Trauma Exposure and the Brain*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [*Invited Lecture*]

- 2016 Presentation entitled *Supporting Cognitive and Emotional Health in Warfighters*. UAHS Development Team, University of Arizona Health Sciences Center, Tucson, AZ [*Invited Lecture*]
- 2016 Lecture entitled Novel Approaches for Reducing Depression in the Military; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [*Invited Lecture*]
- 2016 Presentation entitled: SCAN Lab Traumatic Stress and TBI Studies. Presented at the Tucson Veteran Center, Tucson AZ [*Invited Lecture*]
- 2016 Lecture entitled The Battle for Mosul: An S2 Brief; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [*Invited Lecture*]
- 2017 Lecture entitled *A New Experimental Treatment for Sleep Problems Following Mild TBI*; 105th IMA Detachment, U.S. Army Reserve Center, Boston, MA [*Invited Lecture*]
- 2017 Lecture entitled *Basics of Neuroimaging Research*; UA Psychiatry Resident Neuroscience Course, University of Arizona Department of Psychiatry, Tucson, AZ [*Invited Lecture*]
- 2019 Presentation entitled Physiology Student Opportunities in the Social Cognitive and Affective Neuroscience Lab. Presented at the University of Arizona Physiology Honors Academy, Tucson, AZ [*Invited Discussant*]
- 2019 Presentation entitled Morning Blue Light Exposure Improves Sleep and Fear Extinction Recall in PTSD. Presented at the University of Arizona Sleep Lecture Series, Tucson, AZ [*Invited Lecture*]
- 2019 Presentation entitled Morning Blue Light Exposure Improves Sleep and Fear Extinction Recall in PTSD. Presented at the Annual Club Hypnos Meeting Datablitz, San Antonio, TX [*Invited Lecture*]
- 2021 Presentation entitled Modulating Sleep and Circadian Rhythms to Facilitate Recovery from PTSD. Presented at the University of Arizona MARC Program Lecture Series, Tucson, AZ [*Invited Lecture*]

Seminars

- 2001 *Using Functional MRI to Study the Developing Brain*, Judge Baker Children's Center, Harvard Medical School, Boston, MA [*Invited Lecture*]
- 2002 Lecture on the *Changes in the Lateralized Structure and Function of the Brain during Adolescent Development*, Walter Reed Army Institute of Research, Washington, DC [*Invited Lecture*]
- 2005 Lecture on *Functional Neuroimaging, Cognitive Assessment, and the Enhancement of Soldier Performance*, Walter Reed Army Institute of Research, Washington, DC [*Invited Lecture*]

- 2005 Lecture on *The Sleep History and Readiness Predictor*: Presented to the Medical Research and Materiel Command, Ft. Detrick, MD [*Invited Lecture*]
- 2006 Lecture on *Optimization of Judgment and Decision Making Capacities in Soldiers Following Sleep Deprivation*, Brain Imaging Center, McLean Hospital, Belmont MA [*Invited Lecture*]
- 2006 Briefing to the Chairman of the Cognitive Performance Assessment Program Area Steering Committee, U.S. Army Military Operational Medicine Research Program, entitled *Optimization of Judgment and Decision Making Capacities in Soldiers Following Sleep Deprivation*, Walter Reed Army Institute of Research [*Invited Lecture*]
- 2005 Briefing to the Chairman of the National Research Council (NRC) Committee on Strategies to Protect the Health of Deployed U.S. Forces, John H. Moxley III, on the *Optimization of Judgment and Decision Making Capacities in Soldiers Following Sleep Deprivation*, Walter Reed Army Institute of Research, Washington, DC [*Invited Lecture*]
- 2006 Lecture on *Norming a Battery of Tasks to Measure the Cognitive Effects of Operationally Relevant Stressors*, Cognitive Performance Assessment Program Area Steering Committee, U.S. Army Military Operational Medicine Research Program, Washington, DC [*Invited Lecture*]
- 2007 Lecture on *Cerebral Responses During Visual Processing of Food*, U.S. Army Institute of Environmental Medicine, Natick, MA [*Invited Lecture*]
- 2007 Briefing on the *Measurement of Sleep-Wake Cycles and Cognitive Performance in Combat Aviators*, U.S. Department of Defense, Defense Advanced Research Projects Agency (DARPA), Washington, DC [*Invited Lecture*]
- 2007 Lecture on *The Effects of Fatigue and Pharmacological Countermeasures on Judgment and Decision-Making*, U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL [*Invited Lecture*]
- 2008 Lecture on the *Validation of Actigraphy and the SHARP as Methods of Measuring Sleep and Performance in Soldiers*, U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL [*Seminar*]
- 2009 Lecture on Sleep Deprivation, *Executive Function, and Resilience to Sleep Loss*: Walter Reed Army Institute of Research AIBS Review, Washington DC [*Invited Lecture*]
- 2009 Lecture Entitled *Influences of Combat Exposure and Sleep Deprivation on Risky Decision-Making*, Evans U.S. Army Hospital, Fort Carson, CO [*Invited Lecture*]
- 2009 Lecture on *Making Bad Choices: The Effects of Combat Exposure and Sleep Deprivation on Risky Decision-Making*, 4th Army, Division West, Quarterly Safety Briefing to the Commanding General and Staff, Fort Carson, CO [*Invited Lecture*]

- 2010 Lecture on *Patterns of Cortico-Limbic Activation Across Anxiety Disorders*, Center for Anxiety, Depression, and Stress, McLean Hospital, Belmont, MA [*Invited Lecture*]
- 2010 Lecture on *Cortico-Limbic Activation Among Anxiety Disorders*, Neuroimaging Center, McLean Hospital, Belmont, MA [*Invited Lecture*]
- 2011 Lecture on *Shared and Differential Patterns of Cortico-Limbic Activation Across Anxiety Disorders*, McLean Research Day Brief Communications, McLean Hospital, Belmont, MA [*Invited Lecture*]
- 2011 Lecture Entitled *The effects of emotional intelligence on judgment and decision making*, Military Operational Medicine Research Program Task Area C, R & A Briefing, Walter Reed Army Institute of Research, Silver Spring, MD [*Invited Lecture*]
- 2011 Lecture Entitled *Effects of bright light therapy on sleep, cognition, brain function, and neurochemistry following mild traumatic brain injury*, Military Operational Medicine Research Program Task Area C, R & A Briefing, Walter Reed Army Institute of Research, Silver Spring, MD [*Invited Lecture*]
- 2012 Briefing to GEN (Ret) George Casey Jr., former Chief of Staff of the U.S. Army, entitled *Research for the Soldier*. McLean Hospital, Belmont, MA. [*Invited Lecture*]
- 2012 Lecture Entitled *Effects of bright light therapy on sleep, cognition, brain function, and neurochemistry following mild traumatic brain injury*, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [*Invited Lecture*]
- 2013 Lecture Entitled *Update on the Effects of Bright light therapy on sleep, cognition, brain function, and neurochemistry following mild traumatic brain injury*, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [*Invited Lecture*]
- 2013 Lecture Entitled *Internet Based Cognitive Behavioral Therapy: Effects on Depressive Cognitions and Brain Function*, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [*Invited Lecture*]
- 2013 Seminar Entitled *Predicting Resilience Against Sleep Loss*, United States Military Academy at West Point, West Point, NY [*Invited Symposium*].
- 2014 Lecture entitled *Sleep Loss, Brain Function, and Cognitive Performance*, presented to the Psychiatric Genetics and Translational Research Seminar, Massachusetts General Hospital/Harvard Medical School, Boston, MA [*Invited Lecture*]
- 2014 Grand Rounds Lecture entitled *Sleep Loss, Brain Function, and Performance of the Emotional-Executive System*. University of Arizona Psychiatry Grand Rounds, Tucson, AZ [*Invited Lecture*]

- 2014 Psychology Department Colloquium entitled *Sleep Loss, Brain Function, and Performance of the Emotional-Executive System*. University of Arizona Department of Psychology, Tucson, AZ [Invited Lecture]
- 2014 Lecture Entitled *Internet Based Cognitive Behavioral Therapy: Effects on Depressive Cognitions and Brain Function*, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [Invited Lecture]
- 2014 Lecture Entitled *The Neurobiological Basis and Potential Modification of Emotional Intelligence Through Affective/Behavioral Training*, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [Invited Lecture]
- 2014 Lecture entitled *Supporting Cognitive and Emotional Health in Warfighters*. Presented to the Senior Vice President for Health Sciences and Dean of the Medical School, University of Arizona, Tucson, AZ [Invited Lecture]
- 2015 Lecture entitled *Sleep Loss and Brain Responses to Food*. Presented for the Sleep Medicine Lecture Series, University of Arizona Medical Center, Tucson, AZ [Invited Lecture]
- 2015 Presentation entitled *Superhuman Brains: The Neurocircuitry that Underlies the Ability to Resist Sleep Deprivation*. Presented at the Neuroscience Datablitz, University of Arizona, Tucson, AZ [Invited Lecture]
- 2015 Lecture entitled *Sleep Deprivation Selectively Impairs Emotional Aspects of Cognition*. Presented at the Pamela Turbeville Speaker Series, McClelland Institute for Children, Youth, and Families, Tucson, AZ, [Invited Lecture]
- 2015 Lecture Entitled *Multimodal Neuroimaging to Predict Resistance to Sleep Deprivation*, presented at the Pulmonary Research Conference, Department of Medicine, Sleep Medicine Sleep Lecture Series, University of Arizona College of Medicine, Tucson, AZ [Invited Lecture].
- 2015 Lecture entitled *Sleep Deprivation Selectively Impairs Emotional Aspects of Cognition*. Presented at the Pamela Turbeville Speaker Series, McClelland Institute for Children, Youth, and Families, Tucson, AZ, [Invited Lecture]
- 2015 Lecture Entitled *Effects of bright light therapy on sleep, cognition, brain function, and neurochemistry following mild traumatic brain injury*, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [Invited Lecture]
- 2015 Lecture Entitled *A Non-Pharmacologic Method for Enhancing Sleep in PTSD*, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [Invited Lecture]

- 2015 Lecture Entitled *Internet Based Cognitive Behavioral Therapy: Effects on Depressive Cognitions and Brain Function*, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [*Invited Lecture*]
- 2015 Lecture Entitled *Operating Under the Influence: The Effects of Sleep Loss and Stimulants on Decision-Making and Performance*. Presented at the annual SAFER training for interns and residents, University of Arizona Department of Psychiatry, Tucson AZ [*Invited Lecture*]
- 2016 Lecture entitled *Translational Neuroimaging: Using MRI Techniques to Promote Recovery and Resilience*. Functional Neuroimaging Course, Spring 2016, Psychology Department, University of Arizona, Tucson, AZ [*Invited Lecture*]
- 2016 Lecture entitled *Supporting Cognitive and Emotional Health in Warfighters*. Presented at the Department of Behavioral Biology, Walter Reed Army Institute of Research, Silver Spring, MD [*Invited Lecture*]
- 2016 Lecture Entitled *Internet Based Cognitive Behavioral Therapy: Effects on Depressive Cognitions and Brain Function*, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [*Invited Lecture*]
- 2016 Lecture Entitled *A Model for Predicting Cognitive and Emotional Health from Structural and Functional Neurocircuitry following TBI*, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [*Invited Lecture*]
- 2016 Lecture Entitled *Refinement and Validation of a Military Emotional Intelligence Training Program*, Military Operational Medicine Research Program 2016 Resilience In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [*Invited Lecture*]
- 2017 Lecture Entitled *Bright Light Therapy for Treatment of Sleep Problems following Mild TBI*, Military Operational Medicine Research Program Combat Casualty Care In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [*Invited Lecture*]
- 2017 Lecture Entitled *Refinement and Validation of a Military Emotional Intelligence Training Program*, Military Operational Medicine Research Program 2017 Resilience In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [*Invited Lecture*]
- 2018 Lecture Entitled *Introduction to Chronobiology (Part 1)*, Sleep Research Seminar Series, Walter Reed Army Institute of Research, Silver Spring, MD [*Invited Lecture*]

- 2018 Lecture Entitled *Introduction to Chronobiology (Part 2)*, Sleep Research Seminar Series, Walter Reed Army Institute of Research, Silver Spring, MD [Invited Lecture]
- 2018 Lecture Entitled *A Non-Pharmacologic Method for Enhancing Sleep in PTSD*, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [Invited Lecture]
- 2018 Lecture Entitled *Refinement and Validation of a Military Emotional Intelligence Training Program*, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [Invited Lecture]
- 2019 Lecture Entitled *Update: A Non-Pharmacologic Method for Enhancing Sleep in PTSD*, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [Invited Lecture]
- 2019 Lecture Entitled *Update: Refinement and Validation of a Military Emotional Intelligence Training Program*, Military Operational Medicine Research Program In Progress Review (IPR) Briefing, U.S. Army Medical Research and Materiel Command, Fort Detrick, MD [Invited Lecture]
- 2019 Grand Rounds Lecture entitled *Light Therapy: Implications for Recovery Following PTSD and mTBI*. University of Arizona Psychiatry Grand Rounds, Tucson, AZ [Invited Lecture]
- 2020 Lecture Entitled *Introduction to Chronobiology (Part 1)*, Sleep Research Seminar Series, Walter Reed Army Institute of Research, Silver Spring, MD [Invited Lecture]
- 2020 Lecture Entitled *Introduction to Chronobiology (Part 2)*, Sleep Research Seminar Series, Walter Reed Army Institute of Research, Silver Spring, MD [Invited Lecture]
- 2020 Lecture Entitled *Modulating Sleep and Circadian Rhythms to Facilitate Recovery from PTSD*, McLean Hospital Neuroscience Seminar Speaker Series, Harvard Medical School, Belmont, MA [Invited Lecture]

Symposia/Conferences

- 1999 Oral Platform Presentation entitled *Functional MRI lateralization during memory encoding predicts seizure outcome following anterior temporal lobectomy*, 27th Annual Meeting of the International Neuropsychological Society, Boston, MA. [Submitted Presentation]
- 2000 Lecture on the *Neurobiology of Emotional Development in Children*, 9th Annual Parents as Teachers Born to Learn Conference, St. Louis, MO [Invited Lecture]

- 2001 Oral Platform Presentation entitled *Sex differences in functional activation of the amygdala during the perception of happy faces*, 29th Annual Meeting of the International Neuropsychological Society, Chicago, IL. [Submitted Presentation]
- 2002 Oral Platform Presentation entitled *Developmental changes in the lateralized activation of the prefrontal cortex and amygdala during the processing of facial affect*, 30th Annual Meeting of the International Neuropsychological Society, Toronto, Ontario, Canada. [Submitted Presentation]
- 2002 Oral Platform Presentation *Gray and white matter volume during adolescence correlates with cognitive performance: A morphometric MRI study*, 30th Annual Meeting of the International Neuropsychological Society, Toronto, Ontario, Canada. [Submitted Presentation]
- 2004 Lecture on *Sleep Deprivation, Cognition, and Stimulant Countermeasures*: Seminar Presented at the Bi-Annual 71F Research Psychology Short Course, Ft. Detrick, MD, U.S. Army Medical Research and Materiel Command [Invited Lecture]
- 2004 Lecture on the *Regional Cerebral Blood Flow Correlates of Electroencephalographic Activity During Stage 2 and Slow Wave Sleep: An H215O PET Study*: Presented at the Bi-Annual 71F Research Psychology Short Course, Ft. Detrick, MD, U.S. Army Medical Research and Materiel Command [Invited Lecture]
- 2004 Oral Platform Presentation entitled *Regional cerebral metabolic correlates of electroencephalographic activity during stage-2 and slow-wave sleep: An H215O PET Study*, 18th Associated Professional Sleep Societies Annual Meeting, Philadelphia, PA. [Submitted Presentation]
- 2006 Lecture on *The Sleep History and Readiness Predictor*: Presented at the Bi-Annual 71F Research Psychology Short Course, Ft. Rucker, AL, U.S. Army Medical Research and Materiel Command [Invited Lecture]
- 2007 Symposium on *Cortical and Limbic Activation in Response to Visual Images of Low and High-Caloric Foods*, 6th Annual Meeting of the International Society for Behavioral Nutrition and Physical Activity (ISBNPA), Oslo, Norway [Invited Lecture]
- 2008 Lecture on *Sleep Deprivation, Executive Function, & Resilience to Sleep Loss*, First Franco-American Workshop on War Traumatism, IMN SSA, Toulon, France [Invited Lecture]
- 2009 Symposium Entitled *Sleep Deprivation, Judgment, and Decision-Making*, 23rd Annual Meeting of the Associated Professional Sleep Societies, Seattle, WA [Invited Symposium]
- 2009 Symposium Session Moderator for *Workshop on Components of Cognition and Fatigue: From Laboratory Experiments to Mathematical Modeling and Operational Applications*, Washington State University, Spokane, WA [Invited Speaker]
- 2009 Lecture on *Comparative Studies of Stimulant Action as Countermeasures for Higher Order Cognition and Executive Function Impairment that Results from Disrupted Sleep*

Patterns, Presented at the NIDA-ODS Symposium entitled: Caffeine: Is the Next Problem Already Brewing, Rockville, MD [*Invited Lecture*]

- 2010 Oral Platform Presentation entitled *Sleep deprivation selectively impairs emotional aspects of cognitive functioning*, 27th Army Science Conference, Orlando, FL. [*Submitted Presentation*]
- 2010 Oral Platform Presentation entitled *Exaggerated amygdala responses to masked fearful faces are specific to PTSD versus simple phobia*, 27th Army Science Conference, Orlando, FL. [*Submitted Presentation*]
- 2012 Oral Symposium Presentation entitled *Shared and distinctive patterns of cortico-limbic activation across anxiety disorders*, 32nd Annual Conference of the Anxiety Disorders Association of America, Arlington, VA. [*Invited Symposium*]
- 2012 Oral Platform Presentation entitled *Shared and unique patterns of cortico-limbic activation across anxiety disorders*. 40th Meeting of the International Neuropsychological Society, Montreal, Canada. [*Submitted Presentation*]
- 2013 Lecture entitled *Brain responses to visual images of food: Could your eyes be the gateway to excess?* Presented to the NIH Nutrition Coordinating Committee and the Assistant Surgeon General of the United States, Bethesda, MD [*Invited Lecture*]
- 2014 Symposium Entitled *Operating Under the Influence: The Effects of Sleep Loss and Stimulants on Decision-Making and Performance*, Invited Faculty Presenter at the 34th Annual Cardiothoracic Surgery Symposium (CREF), San Diego, CA [*Invited Symposium*].
- 2014 Symposium Entitled *The Effects of Sleep Loss on Food Preference*, SLEEP 2014, Minneapolis, MN [*Invited Symposium*]
- 2015 Symposium Entitled *The Neurobiological Basis and Potential Modification of Emotional Intelligence in Military Personnel*. Invited presentation at the Yale Center for Emotional Intelligence, New Haven, CT [*Invited Lecture*]
- 2015 Lecture Entitled *Predicting Resilience to Sleep Loss with Multi-Modal Neuroimaging*. Invited presentation at the DARPA Sleep Workshop 2015, Arlington, VA [*Invited Lecture*]
- 2015 Symposium Entitled: *The Brain and Food: How your (sleepy) Eyes Might be the Gateway to Excess*, Invited Faculty Presenter at the 2015 University of Arizona Update on Psychiatry, Tucson, AZ [*Invited Symposium*].
- 2015 Oral Platform presentation entitled *Multimodal Neuroimaging to Predict Resistance to Sleep Deprivation*, Associated Professional Sleep Societies (APSS) SLEEP meeting, Seattle, WA [*Invited Lecture*]

- 2015 Symposium Entitled presentation entitled *Sleep Deprivation and Emotional Decision Making*, Virginia Tech Sleep Workshop, Arlington, VA [*Invited Symposium*]
- 2016 Oral Platform presentation entitled *Default Mode Activation Predicts Vulnerability to Sleep Deprivation in the Domains of Mood, Sleepiness, and Vigilance*. Presentation given at the Associated Professional Sleep Societies (APSS) SLEEP meeting, Denver, CO [*Invited Lecture*]
- 2016 Symposium presentation entitled *Short Wavelength Light Therapy Facilitates Recovery from Mild Traumatic Brain Injury*, 2016 Military Health Systems Research Symposium (MHSRS), Orlando, FL [*Invited Lecture*]
- 2017 Lecture Entitled: *Military Update on Blue Light Therapy for mTBI*. Lecture presented at the DoD Sleep Research Meeting breakout session at the Associated Professional Sleep Societies (APSS) SLEEP meeting, Boston, MA [*Invited Lecture*]
- 2017 Symposium entitled: *Judgment and Decision Making During Sleep Loss*. Invited symposium presentation at the SLEEP 2017 Trainee Symposium Series, Associated Professional Sleep Societies (APSS) SLEEP meeting, Boston, MA [*Invited Lecture*]
- 2017 Oral Platform presentation entitled *Short Wavelength Light Therapy Facilitates Recovery from Mild Traumatic Brain Injury*. Presentation given at the Associated Professional Sleep Societies (APSS) SLEEP meeting, Boston, MA [*Invited Lecture*]
- 2017 Symposium entitled: What makes a super-soldier: Identifying the neural correlates of individual differences in resilience against sleep deprivation. Invited symposium presentation at the 2017 Military Health Systems Research Symposium (MHSRS), Orlando, FL [*Invited Lecture*]
- 2018 Oral Platform presentation entitled: *Short Wavelength Light Therapy Enhances Brain and Cognitive Recovery Following Mild Traumatic Brain Injury*. Presentation given at the Arizona Research Institute for Biomedical Imaging (ARIBI) Workshop, Tucson, AZ [*Invited Lecture*]
- 2018 Session Chair: *Healthy Shiftwork? Measures, Mitigation and Functional Outcomes*. Session presented at the Associated Professional Sleep Societies (APSS) SLEEP Conference (Session O02), Baltimore, MD [*Session Chair*]
- 2018 Lecture Entitled: *Lapses During Sleep Loss are Predicted by Gray Matter Volume of the Ascending Reticular Activating Systems*. Lecture presented at the 2nd Annual DoD Sleep Research Meeting breakout session at the Associated Professional Sleep Societies (APSS) SLEEP meeting, Baltimore, MD [*Invited Lecture*]

- 2018 Oral Platform presentation entitled *Resistance to Sleep Deprivation is Predicted by Gray Matter Volume in the Posterior Brain Stem*. Presentation given at the Associated Professional Sleep Societies (APSS) SLEEP meeting, Baltimore, MD [Invited Lecture]
- 2018 Oral Platform presentation entitled *Why Can't You Just Stay Awake? Resistance to Sleep Deprivation is Associated with Measurable Differences in Brainstem Gray Matter*. Presentation given at the Military Health Systems Research Symposium (MHSRS) 2018 Meeting, Orlando, FL [Invited Lecture]
- 2019 Oral Platform presentation entitled *Morning Blue Light Exposure Improves Sleep and Fear Extinction Recall in PTSD*. Presentation given at the Associated Professional Sleep Societies (APSS) SLEEP 2019 meeting, San Antonio, TX [Invited Lecture]
- 2019 Oral Platform presentation entitled *Blue Light Exposure Enhances Sleep and Fear Extinction Recall in PTSD*. Presentation given at the Military Health Systems Research Symposium (MHSRS) 2019 Meeting, Orlando, FL [Invited Lecture]
- 2019 Oral Platform presentation entitled *Baseline GABA Levels are Associated with Time-on-Task Performance During Sleep Deprivation*. Presentation given at the Military Health Systems Research Symposium (MHSRS) 2019 Meeting, Orlando, FL [Invited Lecture]
- 2020 Oral Platform presentation entitled *GABA Levels at Baseline Predict Resistance to Time-on-Task Deficits During Sleep Deprivation*. Presentation given at the DoD Sleep Workshop, Feb 2020, Arlington, VA [Invited Lecture]
- 2020 Oral Platform presentation entitled *Resilience to Inhibitory Deficits During Sleep Deprivation is Predicted by Prefrontal Gray Matter Volume*. Presentation given at the DoD Sleep Workshop, Feb 2020, Arlington, VA [Invited Lecture]
- 2020 Oral Platform presentation entitled *Resilience to Inhibitory Deficits During Sleep Deprivation is Predicted by Gray Matter Volume in the Ventrolateral and Ventromedial Prefrontal Cortex*. Presentation given at the SLEEP 2020 Virtual Meeting, Philadelphia, PA [Invited Lecture]
- 2021 Symposium Session Moderator for *College of Medicine Research Day Data Blitz*, University of Arizona College of Medicine, Tucson, AZ [Invited Moderator]

PEER REVIEWED PUBLISHED ABSTRACTS

1. **Killgore, WD.** Development and validation of a new instrument for the measurement of

transient mood states: The facial analogue mood scale (FAMS) [Abstract]. Dissertation Abstracts International: Section B: The Sciences & Engineering 1995; 56 (6-B): 3500.

2. **Killgore, WD,** & Locke, B. A nonverbal instrument for the measurement of transient mood states: The Facial Analogue Mood Scale (FAMS) [Abstract]. Proceedings of the Annual Conference of the Oklahoma Center for Neurosciences 1996, Oklahoma City, OK.
3. **Killgore, WD,** Scott, JG, Oommen, KJ, & Jones, H. Lateralization of seizure focus and performance on the MMPI-2 [Abstract]. Proceedings of the Annual Conference of the Oklahoma Center for Neurosciences 1996, Oklahoma City, OK.
4. **Killgore, WD,** & Adams, RL. Vocabulary ability and Boston Naming Test performance: Preliminary guidelines for interpretation [Abstract]. Archives of Clinical Neuropsychology 1997; 13(1).
5. **Killgore, WD,** Glosser, G, Cooke, AN, Grossman, M, Maldjian, J, Judy, K, Baltuch, G, King, D, Alsop, D, & Detre, JA. Functional activation during verbal memory encoding in patients with lateralized focal lesions [Abstract]. Epilepsia 1998; 39(Suppl. 6): 99.
6. **Killgore, WD.** A new method for assessing subtle cognitive deficits: The Clock Trail Making Test [Abstract]. Archives of Clinical Neuropsychology 1998; 14(1): 92.
7. **Killgore, WD,** & DellaPietra, L. Item response biases on the WMS-III Auditory Delayed Recognition Subtests [Abstract]. Archives of Clinical Neuropsychology 1998; 14(1): 92.
8. **Killgore, WD,** Glosser, G, Alsop, DC, Cooke, AN, McSorley, C, Grossman, M, & Detre, JA. Functional activation during material specific memory encoding [Abstract]. NeuroImage 1998; 7: 811.
9. **Killgore, WD,** & DellaPietra, L. Using the WMS-III to detect malingering: Empirical development of the Rarely Missed Index. [Abstract]. Journal of the International Neuropsychological Society 1999; 5(2).
10. **Killgore, WD,** Glosser, G, & Detre, JA. Prediction of seizure outcome following anterior temporal lobectomy: fMRI vs. IAT [Abstract]. Archives of Clinical Neuropsychology 1999; 14(1): 143.
11. **Killgore, WD,** Glosser, G, King, D, French, JA, Baltuch, G, & Detre, JA. Functional MRI lateralization during memory encoding predicts seizure outcome following anterior temporal lobectomy [Abstract]. Journal of the International Neuropsychological Society 1999; 5(2): 122.
12. **Killgore, WD,** Casasanto, DJ, Maldjian, JA, Alsop, DC, Glosser, G, French, J, & Detre, J. A. Functional activation of mesial temporal lobe during nonverbal encoding [abstract]. Epilepsia, 1999; 40 (Supplement 7): 188.
13. **Killgore, WD,** Casasanto, DJ, Maldjian, JA, Gonzales-Atavales, J, & Detre, JA. Associative memory for faces preferentially activates the left amygdala and hippocampus [abstract]. Journal of the International Neuropsychological Society, 2000; 6: 157.

14. Casasanto, DJ, **Killgore, WD**, Maldjian, JA, Gonzales-Atavales, J, Glosser, G, & Detre, JA. Task-dependent and task-invariant activation in mesial temporal lobe structures during fMRI explicit encoding tasks [abstract]. Journal of the International Neuropsychological Society, 2000; 6: 134. [**Winner of Rennick Research Award for Best Research by a Graduate Student*].
15. **Killgore, WD**, Glahn, D, & Casasanto, DJ. Development and validation of the Design Organization Test (DOT): A rapid screening instrument for assessing for visuospatial ability [abstract]. Journal of the International Neuropsychological Society, 2000; 6: 147.
16. Casasanto DJ, **Killgore, WD**, Glosser, G, Maldjian, JA, & Detre, JA. Hemispheric specialization during episodic memory encoding in the human hippocampus and MTL. Proceedings of the Society for Cognitive Science 2000: Philadelphia, PA.
17. Casasanto, DJ, Glosser, G, **Killgore, WD**, Siddiqi, F, Falk, M, Maldjian, J, Lev-Reis, I, & Detre, JA. FMRI evidence for the functional reserve model of post-ATL neuropsychological outcome prediction. Poster Presented at the David Mahoney Institute of Neurological Sciences 17th Annual Neuroscience Retreat, University of Pennsylvania, April 17, 2000.
18. Casasanto, DJ, **Killgore, WD**, Maldjian, JA, Glosser, G, Grossman, M, Alsop, D. C, & Detre, JA. Neural Correlates of Successful and Unsuccessful Verbal Encoding [abstract]. Neuroimage, 2000 11: S381.
19. Siddiqui, F, Casasanto, DJ, **Killgore, WD**, Detre, JA, Glosser, G, Alsop, DC, & Maldjian, JA. Hemispheric effects of frontal lobe tumors on mesial temporal lobe activation during scene encoding [abstract]. Neuroimage, 2000 11: S448.
20. Oki, M, Gruber, SA, **Killgore, WD**, Yurgelun-Todd, DA. Bilateral thalamic activation occurs during lexical but not semantic processing [abstract]. Neuroimage, 2000 11: S353.
21. Yurgelun-Todd, DA, Gruber, SA, **Killgore, WD**, & Tohen, M. Neuropsychological performance in first-episode bipolar disorder [Abstract]. Collegium Internationale Neuro-Psychopharmacologicum. Brussels, Belgium. July, 2000.
22. **Killgore, WD**, & DellaPietra, L. Detecting malingering with the WMS-III: A revision of the Rarely Missed Index (RMI) [abstract]. Journal of the International Neuropsychological Society, 2001; 7 (2): 143-144.
23. Casasanto, DJ, Glosser, G, **Killgore, WD**, Siddiqi, F, Falk, M, Roc, A, Maldjian, JA, Levy-Reis, I, Baltuch, G, & Detre, JA. Presurgical fMRI predicts memory outcome following anterior temporal lobectomy [abstract]. Journal of the International Neuropsychological Society, 2001; 7 (2): 183.
24. **Killgore, WD**, & Yurgelun-Todd, DA. Amygdala but not hippocampal size predicts verbal memory performance in bipolar disorder [abstract]. Journal of the International Neuropsychological Society, 2001; 7 (2): 250-251.
25. **Killgore, WD**, Kanayama, G, & Yurgelun-Todd, DA. Sex differences in functional activation of

the amygdala during the perception of happy faces [abstract]. Journal of the International Neuropsychological Society, 2001; 7 (2): 198.

26. **Killgore, WD**, Gruber, SA, Oki, M, & Yurgelun-Todd, DA. Amygdalar volume and verbal memory in schizophrenia and bipolar disorder: A correlative MRI study [abstract]. Meeting of the International Congress on Schizophrenia Research. Whistler, British Columbia. April 2001.
27. Kanayama, G, **Killgore, WD**, Gruber, SA, & Yurgelun-Todd, DA. FMRI BOLD activation of the supramarginal gyrus in schizophrenia [abstract]. Meeting of the International Congress on Schizophrenia Research. Whistler, British Columbia. April 2001.
28. Gruber, SA, **Killgore, WD**, Renshaw, PF, Pope, HG. Jr, Yurgelun-Todd, DA. Gender differences in cerebral blood volume after a 28-day washout period in chronic marijuana smokers [abstract]. Meeting of the International Congress on Schizophrenia Research. Whistler, British Columbia. April 2001.
29. Rohan, ML, **Killgore, WD**, Eskesen, JG, Renshaw, PF, & Yurgelun-Todd, DA. Match-warped EPI anatomic images and the amygdala: Imaging in hard places. Proceedings of the International Society for Magnetic Resonance in Medicine, 2001; 9: 1237.
30. **Killgore, WD** & Yurgelun-Todd, DA. Developmental changes in the lateralized activation of the prefrontal cortex and amygdala during the processing of facial affect [Abstract]. Oral platform paper presented at the 30th Annual Meeting of the International Neuropsychological Society, Toronto, Ontario, Canada, February 13-16, 2002.
31. Yurgelun-Todd, DA. & **Killgore, WD**. Gray and white matter volume during adolescence correlates with cognitive performance: A morphometric MRI study [Abstract]. Oral platform paper presented at the 30th Annual Meeting of the International Neuropsychological Society, Toronto, Ontario, Canada, February 13-16, 2002.
32. **Killgore, WD**, Reichardt, R. Kautz, M, Belenky, G, Balkin, T, & Wesensten, N. Daytime melatonin-zolpidem cocktail: III. Effects on salivary melatonin and performance [abstract]. Poster presented at the 17th Annual Meeting of the Associated Professional Sleep Societies, Chicago, Illinois, June 3-8, 2003.
33. **Killgore, WD**, Young, AD, Femia, LA, Bogorodzki, P, Rogowska, J, & Yurgelun-Todd, DA. Cortical and limbic activation during viewing of high- versus low-calorie foods [abstract]. Poster Presented at the Organization for Human Brain Mapping Annual Meeting, New York, NY, June 18-22, 2003.
34. **Killgore, WD**, & Yurgelun-Todd, DA. Amygdala activation during masked presentations of sad and happy faces [abstract]. Poster presented at the Organization for Human Brain Mapping Annual Meeting, New York, NY, June 18-22, 2003.
35. **Killgore, WD**, Stetz, MC, Castro, CA, & Hoge, CW. Somatic and emotional stress symptom expression prior to deployment by soldiers with and without previous combat experience [abstract]. Poster presented at the 6th Annual Force Health Protection Conference, Albuquerque, NM, August, 11-17, 2003. [**Winner: Best Paper Award*]

36. Wesensten, NJ, Balkin, TJ, Thorne, D, **Killgore, WD**, Reichardt, R, & Belenky, G. Caffeine, dextroamphetamine, and modafinil during 85 hours of sleep deprivation: I. Performance and alertness effects [abstract]. Poster presented at the 75th Annual Meeting of the Aerospace Medical Association, Anchorage, AK, May 2-6 2004.
37. **Killgore, WD**, Braun, AR, Belenky, G, Wesensten, NJ, & Balkin, TJ. Regional cerebral metabolic correlates of electroencephalographic activity during stage-2 and slow-wave sleep: An H215O PET Study [abstract]. Oral platform presentation at the 18th Associated Professional Sleep Societies Annual Meeting, Philadelphia, PA, June 5-10, 2004.
38. **Killgore, WD**, Arora, NS, Braun, AR, Belenky, G, Wesensten, NJ, & Balkin, TJ. Sleep strengthens the effective connectivity among cortical and subcortical regions: Evidence for the restorative effects of sleep using H215O PET [abstract]. Poster presented at the 17th Congress of the European Sleep Research Society, Prague, Czech Republic, October 5-9, 2004.
39. **Killgore, WD**, Arora, NS, Braun, AR, Belenky, G, Wesensten, NJ, & Balkin, TJ. An H215O PET study of regional cerebral activation during stage 2 sleep [abstract]. Poster presented at the 17th Congress of the European Sleep Research Society, Prague, Czech Republic, October 5-9, 2004.
40. Wesensten, N, **Killgore, WD**, Belenky, G, Reichardt, R, Thorne, D, & Balkin, T. Caffeine, dextroamphetamine, and modafinil during 85 H of sleep deprivation. II. Effects of tasks of executive function [abstract]. Poster presented at the 17th Congress of the European Sleep Research Society, Prague, Czech Republic, October 5-9, 2004.
41. Balkin, T, Reichardt, R, Thorne, D, **Killgore, WD**, Belenky, G, & Wesensten, N. Caffeine, dextroamphetamine, and modafinil during 85 hours of sleep deprivation. I. Psychomotor vigilance and objective alertness effects [abstract]. Oral paper presentation at the 17th Congress of the European Sleep Research Society, Prague, Czech Republic, October 5-9, 2004.
42. Belenky, G, Reichardt, R, Thorne, D, **Killgore, WD**, Balkin, T, & Wesensten, N. Caffeine, dextroamphetamine, and modafinil during 85 hours of sleep deprivation. III. Effect on recovery sleep and post-recovery sleep performance [abstract]. Oral paper presentation at the 17th Congress of the European Sleep Research Society, Prague, Czech Republic, October 5-9, 2004.
43. Vo, A, Green, J, Campbell, W, **Killgore, WD**, Labutta, R, & Redmond, D. The quantification of disrupted sleep in migraine via actigraphy: A pilot study [abstract]. Abstract presented at the Associated Professional Sleep Societies 19th Annual Meeting, Denver, CO, June 18-23, 2005. SLEEP, 28 (Supplement), A281.
44. Kendall, AP, **Killgore, WD**, Kautz, M, & Russo, MB. Left-visual field deficits in attentional processing after 40 hours of sleep deprivation [abstract]. Abstract presented at the Associated Professional Sleep Societies 19th Annual Meeting, Denver, CO, June 18-23, 2005. SLEEP, 28 (Supplement), A143.
45. Reichardt, RM, Grugle, NL, Balkin, TJ, & **Killgore, WD**. Stimulant countermeasures, risk propensity, and IQ across 2 nights of sleep deprivation [abstract]. Abstract presented at the

Associated Professional Sleep Societies 19th Annual Meeting, Denver, CO, June 18-23, 2005. SLEEP, 28 (Supplement), A145.

46. Killgore, DB, McBride, SA, Balkin, TJ, & **Killgore, WD**. Post-stimulant hangover: The effects of caffeine, modafinil, and dextroamphetamine on sustained verbal fluency following sleep deprivation and recovery sleep [abstract]. Abstract presented at the Associated Professional Sleep Societies 19th Annual Meeting, Denver, CO, June 18-23, 2005. SLEEP, 28 (Supplement), A137.
47. **Killgore, WD**, Balkin, TJ, & Wesensten, NJ. Impaired decision-making following 49 hours of sleep deprivation [abstract]. Abstract presented at the Associated Professional Sleep Societies 19th Annual Meeting, Denver, CO, June 18-23, 2005. SLEEP, 28 (Supplement), A138.
48. **Killgore, WD**, McBride, SA, Killgore, DB, & Balkin, TJ. Stimulant countermeasures and risk propensity across 2 nights of sleep deprivation [abstract]. Abstract presented at the Associated Professional Sleep Societies 19th Annual Meeting, Denver, CO, June 18-23, 2005. SLEEP, 28 (Supplement), A136.
49. McBride, SA, Balkin, TJ, & **Killgore, WD**. The effects of 24 hours of sleep deprivation on odor identification accuracy [abstract]. Abstract presented at the Associated Professional Sleep Societies 19th Annual Meeting, Denver, CO, June 18-23, 2005. SLEEP, 28 (Supplement), A137.
50. Picchioni, D, **Killgore, WD**, Braun, AR, & Balkin, TJ. PET correlates of EEG activity during non-REM sleep. Poster presentation at the annual UCLA/Websciences Sleep Training Workshop, Lake Arrowhead, CA, September, 2005.
51. **Killgore, WD**, Killgore, DB, McBride, SA, & Balkin, TJ. Sustained verbal fluency following sleep deprivation and recovery sleep: The effects of caffeine, modafinil, and dextroamphetamine. Poster presented at the 34th Meeting of the International Neuropsychological Society, Boston, MA, February 1-4, 2006.
52. **Killgore, WD**, Balkin, TJ, & Wesensten, NJ. Decision-making is impaired following 2-days of sleep deprivation. Poster presented at the 34th Meeting of the International Neuropsychological Society, Boston, MA, February 1-4, 2006.
53. **Killgore, WD**, & Yurgelun-Todd, DA. Neural correlates of emotional intelligence in adolescent children. Poster presented at the 34th Meeting of the International Neuropsychological Society, Boston, MA, February 1-4, 2006.
54. **Killgore, WD**, & Yurgelun-Todd, DA. Social anxiety predicts amygdala activation in adolescents viewing fearful faces. Poster presented at the 34th Meeting of the International Neuropsychological Society, Boston, MA, February 1-4, 2006.
55. McBride, SA & **Killgore, WD**. Sleepy people smell worse: Olfactory deficits following extended wakefulness. Paper presented at the Workshop on Trace Gas Detection Using Artificial, Biological, and Computational Olfaction. Monell Chemical Senses Center, Philadelphia, PA, March 29-31, 2006.

56. **Killgore, WD**, Day LM, Li, C, Kamimori, GH, Balkin, TJ, & Killgore DB. Moral reasoning is affected by sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A137.
57. **Killgore, WD**, Killgore DB, Kahn-Green, E, Conrad, A, Balkin, TJ, & Kamimori, G. H. Introversion-Extroversion predicts resilience to sleep loss [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A137.
58. Newman, R, Kamimori, GH, **Killgore, WD**. Sleep deprivation diminishes constructive thinking [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A136-137.
59. Huck, NO, Kendall, AP, McBride, SA, **Killgore, WD**. The perception of facial emotion is enhanced by psychostimulants following two nights of sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A136.
60. O'Sullivan, M, Reichardt, RM, Krugler, AL, Killgore, DB, & **Killgore, WD**. Premorbid intelligence correlates with duration and quality of recovery sleep following sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A372.
61. McBride, SA, **Killgore, WD**, Kahn-Green, E, Conrad, A, & Kamimori, GH. Caffeine administered to maintain overnight alertness does not disrupt performance during the daytime withdrawal period [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A136.
62. McBride, SA, Killgore DB, Balkin, TJ, Kamimori, GH, & **Killgore, WD**. Sleepy people smell worse: Olfactory decrements as a function of sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A135.
63. Day, LM, Li, C, Killgore, DB, Kamimori, GH, & **Killgore, WD**. Emotional intelligence moderates the effect of sleep deprivation on moral reasoning [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A135.
64. Murray, CJ, Killgore, DB, Kamimori, GH, & **Killgore, WD**. Individual differences in stress management capacity predict responsiveness to caffeine during sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A43.
65. Murray, CJ, Newman, R, O'Sullivan, M, Killgore, DB, Balkin, TJ, & **Killgore, WD**. Caffeine, dextroamphetamine, and modafinil fail to restore Stroop performance during sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies,

Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A370-371.

66. Richards, J, Killgore, DB, & **Killgore, WD**. The effect of 44 hours of sleep deprivation on mood using the Visual Analog Mood Scales [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A132.
67. Richards, J, & **Killgore, WD**. The effect of caffeine, dextroamphetamine, and modafinil on alertness and mood during sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A43.
68. Lipizzi, EL, Leavitt, BP, Killgore, DB, Kamimori, GH, & **Killgore, WD**. Decision making capabilities decline with increasing duration of wakefulness [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A131.
69. Lipizzi, EL, Killgore, DB, Kahn-Green, E, Kamimori, GH, & **Killgore, WD**. Emotional intelligence scores decline during sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A131.
70. Kahn-Green, E, Day, L, Conrad, A, Leavitt, BP, Killgore, DB, & **Killgore, WD**. Short-term vs. long-term planning abilities: Differential effects of stimulants on executive function in sleep deprived individuals [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A370.
71. Kahn-Green, E, Conrad, A, Killgore, DB, Kamimori, GH, & **Killgore, WD**. Tired and frustrated: Using a projective technique for assessing responses to stress during sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A130.
72. Killgore, DB, Kahn-Green, E, Balkin, TJ, Kamimori, GH, & **Killgore, WD**. 56 hours of wakefulness is associated with a sub-clinical increase in symptoms of psychopathology [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A130.
73. Killgore, DB, McBride, SA, Balkin, TJ, Leavitt, BP, & **Killgore, WD**. Modafinil improves humor appreciation during sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A42.
74. Reichardt, RM, Killgore, DB, Lipizzi, EL, Li, CJ, Krugler, AL, & **Killgore, WD**. The effects of stimulants on recovery sleep and post-recovery verbal performance following 61-hours of sleep deprivation [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A42.

75. Bailey, JD, Richards, J, & **Killgore, WD**. Prediction of mood fluctuations during sleep deprivation with the SAFTE Model [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A60.
76. Kendall, AP, McBride, S. A, & **Killgore, WD**. Visuospatial perception of line orientation is resistant to one night of sleep loss [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A369.
77. Kendall, AP, McBride, SA, Kamimori, GH, & **Killgore, WD**. The interaction of coping skills and stimulants on sustaining vigilance: Poor coping may keep you up at night [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A129.
78. Muckle, A, Killgore, DB, & **Killgore, WD**. Gender differences in the effects of stimulant medications on the ability to estimate unknown quantities when sleep deprived [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A369.
79. Krugler, AL, **Killgore, WD**, & Kamimori, G. H. Trait anger predicts resistance to sleep loss [abstract]. Abstract presented at the 20th Meeting of the Associated Professional Sleep Societies, Salt Lake City, UT, June 17-22, 2006. SLEEP, 29 (Supplement), A129.
80. **Killgore, WD**, Cotting, DI, Vo, A. H, Castro, CA, & Hoge, CW. The invincibility syndrome: Combat experiences predict risk-taking propensity following redeployment [abstract]. Abstract presented at the 9th Annual Force Health Protection Conference, Albuquerque, NM, August 6-11, 2006.
81. **Killgore, WD**, Wesensten, NJ, & Balkin, TJ. Stimulants improve tactical but not strategic planning during prolonged wakefulness [abstract]. Abstract presented at the 9th Annual Force Health Protection Conference, Albuquerque, NM, August 6-11, 2006.
82. **Killgore, WD**, Balkin, TJ, Wesensten, NJ, & Kamimori, G. H. The effects of sleep loss and caffeine on decision-making [abstract]. Abstract presented at the 9th Annual Force Health Protection Conference, Albuquerque, NM, August 6-11, 2006.
83. **Killgore, WD**, Balkin, TJ, & Kamimori, GH. Sleep loss can impair moral judgment [abstract]. Abstract presented at the 9th Annual Force Health Protection Conference, Albuquerque, NM, August 6-11, 2006.
84. **Killgore, WD**, Lipizzi, EL, Reichardt, RM, Kamimori, GH, & Balkin, TJ. Can stimulants reverse the effects of sleep deprivation on risky decision-making [abstract]? Abstract presented at the 25th Army Science Conference, Orlando, FL, November 27-30, 2006.
85. **Killgore, WD**, Killgore, DB, Kamimori, GH, & Balkin, TJ. Sleep deprivation impairs the emotional intelligence and moral judgment capacities of Soldiers [abstract]. Abstract presented at the 25th Army Science Conference, Orlando, FL, November 27-30, 2006.

86. **Killgore, WD**, Cotting, DI, Vo, AH, Castro, C.A, & Hoge, CW. The post-combat invincibility syndrome: Combat experiences increase risk-taking propensity following deployment [abstract]. Abstract presented at the 25th Army Science Conference, Orlando, FL, November 27-30, 2006.
87. Adam, GE, Szelenyi, ER, **Killgore, WD**, & Lieberman, HR. A double-blind study of two days of caloric deprivation: Effects on judgment and decision-making. Oral paper presentation at the Annual Scientific Meeting of the Aerospace Medical Association, New Orleans, LA, May, 2007.
88. Killgore, DB, Kahn-Greene, ET, Kamimori, GH, & **Killgore, WD**. The effects of acute caffeine withdrawal on short category test performance in sleep deprived individuals [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A43.
89. Richards, JM, Lipizzi, EL, Kamimori, GH, & **Killgore, WD**. Extroversion predicts change in attentional lapses during sleep deprivation [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A137.
90. Lipizzi, EL, Richards, JM, Balkin, TJ, Grugle, NL, & **Killgore, WD**. Morningness-Eveningness and Intelligence [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A345.
91. Lipizzi, EL, Richards, JM, Balkin, TJ, Grugle, NL, & **Killgore WD**. Morningness-Eveningness affects risk-taking propensity during sleep deprivation [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A136.
92. McBride, SA, Ganesan, G, Kamimori, GH, & **Killgore, WD**. Odor identification ability predicts vulnerability to attentional lapses during 77 hours of sleep deprivation [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A135.
93. Smith, KL, McBride, S. A, Kamimori, GH, & **Killgore, WD**. Individual differences in odor discrimination predict mood dysregulation following 56 hours of sleep deprivation [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A136.
94. McBride, SA, Leavitt, BP, Kamimori, GH, & **Killgore, WD**. Odor identification accuracy predicts resistance to sleep loss. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A137.
95. Killgore, DB, McBride, SA, Balkin, TJ, Grugle, NL. & **Killgore, WD**. Changes in odor discrimination predict executive function deficits following 45 hours of wakefulness [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A136.

96. Rupp, TL, Killgore, DB, Balkin, TJ, Grugle, NL, & **Killgore, WD**. The effects of modafinil, dextroamphetamine, and caffeine on verbal and nonverbal fluency in sleep deprived individuals [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A43.
97. Newman, RA, Krugler, AL, Kamimori, GH, & **Killgore, WD**. Changes in state and trait anger following 56 hours of sleep deprivation [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A138.
98. Rupp, TL, Grugle, NL, Krugler, AL, Balkin, TJ, & **Killgore, WD**. Caffeine, dextroamphetamine, and modafinil improve PVT performance after sleep deprivation and recovery sleep [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A44.
99. **Killgore, WD**, Lipizzi, EL, Balkin, TJ, Grugle, NL, & Killgore, DB. The effects of sleep deprivation and stimulants on self-reported sensation seeking propensity [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A42.
100. **Killgore, WD**, Richards, JM, Balkin, TJ, Grugle, NL, & Killgore DB. The effects of sleep deprivation and stimulants on risky behavior [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A41.
101. Newman, RA, Smith, KL, Balkin, TJ, Grugle, NL, & **Killgore, WD**. The effects of caffeine, dextroamphetamine, and modafinil on executive functioning following 45 hours of sleep deprivation [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A45.
102. Richards, JM, Lipizzi, EL, Balkin, TJ, Grugle, NL, & **Killgore, WD**. Objective alertness predicts mood changes during 44 hours of sleep deprivation [abstract]. Abstract presented at the 21st Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 9-14, 2007. SLEEP, 30 (Supplement), A56.
103. **Killgore, WD**, & Yurgelun-Todd, DA. Cortical and Limbic Activation in Response to Visual Images of Low and High-Caloric Food [abstract]. Oral symposium presented at the 6th Annual Conference of the Society of Behavioral Nutrition and Physical Activity (ISBNPA), Oslo, Norway, June 20-23, 2007. Proceedings of the ISBNPA, 2007, 75.
104. Estrada, A, **Killgore, WD**, Rouse, T, Balkin, TJ, & Wildzunas, RM. Total sleep time measured by actigraphy predicts academic performance during military training [abstract]. Abstract presented at the 22nd Meeting of the Associated Professional Sleep Societies, Baltimore, MD, June 7-12, 2008. SLEEP, 31 (Supplement), A134.
105. **Killgore, WD**, Lipizzi, EL, Smith, KL, Killgore, DB, Rupp, TL, Kamimori, GH, & Balkin, T. J. Nonverbal intelligence is inversely related to the ability to resist sleep loss [abstract]. Abstract presented at the 22nd Meeting of the Associated Professional Sleep Societies, Baltimore, MD,

June 7-12, 2008. SLEEP, 31 (Supplement), A134.

106. **Killgore, WD**, Lipizzi, EL, Killgore, DB, Rupp, TL, Kamimori, GH, & Balkin, TJ. Emotional intelligence predicts declines in emotion-based decision-making following sleep deprivation [abstract]. Abstract presented at the 22nd Meeting of the Associated Professional Sleep Societies, Baltimore, MD, June 7-12, 2008. SLEEP, 31 (Supplement), A134.
107. Reid, CT, Smith, K, **Killgore, WD**, Rupp, TL, & Balkin, TJ. Higher intelligence is associated with less subjective sleepiness during sleep restriction [abstract]. Abstract presented at the 22nd Meeting of the Associated Professional Sleep Societies, Baltimore, MD, June 7-12, 2008. SLEEP, 31 (Supplement), A375.
108. Newman, R, **Killgore, WD**, Rupp, T. L, & Balkin, TJ. Better baseline olfactory discrimination is associated with worse PVT and MWT performance with sleep restriction and recovery [abstract]. Abstract presented at the 22nd Meeting of the Associated Professional Sleep Societies, Baltimore, MD, June 7-12, 2008. SLEEP, 31 (Supplement), A375.
109. Smith, KL, Reid, CT, **Killgore, WD**, Rupp, TL, & Balkin, TJ. Personality factors associated with performance and sleepiness during sleep restriction and recovery [abstract]. Abstract presented at the 22nd Meeting of the Associated Professional Sleep Societies, Baltimore, MD, June 7-12, 2008. SLEEP, 31 (Supplement), A376.
110. Lipizzi, EL, **Killgore, WD**, Rupp, TL, & Balkin, TJ. Risk-taking behavior is elevated during recovery from sleep restriction [abstract]. Abstract presented at the 22nd Meeting of the Associated Professional Sleep Societies, Baltimore, MD, June 7-12, 2008. SLEEP, 31 (Supplement), A376.
111. Lipizzi, EL, Rupp, TL, **Killgore, WD**, & Balkin, TJ. Sleep restriction increases risk-taking behavior [abstract]. Poster presented at the 11th Annual Force Health Protection Conference, Albuquerque, NM, August, 9-15, 2008.
112. **Killgore, WD**, Estrada, A, Balkin, TJ, & Wildzunas, RM. Sleep duration during army training predicts course performance [abstract]. Poster presented at the 11th Annual Force Health Protection Conference, Albuquerque, NM, August, 11-17, 2008.
113. **Killgore, WD**, Lipizzi, EL, Smith, KL, Killgore, DB, Rupp, TL, Kamimori, GH, & Balkin, TJ. Higher cognitive ability is associated with reduced relative resistance to sleep loss [abstract]. Poster presented at the 11th Annual Force Health Protection Conference, Albuquerque, NM, August, 11-17, 2008.
114. **Killgore, WD**, Rupp, TL, Grugle, NL, Lipizzi, EL, & Balkin, TJ. Maintaining alertness during sustained operations: Which stimulant is most effective after 44 hours without sleep [abstract]? Poster presented at the 11th Annual Force Health Protection Conference, Albuquerque, NM, August, 11-17, 2008.
115. **Killgore, WD**, Newman, RA, Lipizzi, EL, Kamimori, GH, & Balkin, TJ. Sleep deprivation increases feelings of anger but reduces verbal and physical aggression in Soldiers [abstract]. Poster presented at the 11th Annual Force Health Protection Conference, Albuquerque, NM,

August, 11-17, 2008.

116. Kelley, AM, Dretsch, M, **Killgore, WD**, & Athy, JR. Risky behaviors and attitudes about risk in Soldiers. Abstract presented at the 29th Annual Meeting of the Society for Judgment and Decision Making, Chicago, IL, November, 2008.
117. **Killgore, WD**, Ross, AJ, Silveri, MM, Gruber, SA, Kamiya, T, Kawada, Y, Renshaw, PF, & Yurgelun-Todd, DA. Citicoline affects appetite and cortico-limbic responses to images of high calorie foods. Abstract presented at the Society for Neuroscience, Washington DC, November 19, 2008.
118. Britton, JC, Stewart, SE, Price, LM, **Killgore, WD**, Gold, AL, Jenike, MA, & Rauch, SL. Reduced amygdalar activation in response to emotional faces in pediatric Obsessive-Compulsive Disorder. Abstract presented at the Annual meeting of the American College of Neuropsychopharmacology, Scottsdale, AZ, December 7-11, 2008.
119. **Killgore, WD**, Balkin, TJ, Estrada, A, & Wildzunas, RM. Sleep and performance measures in soldiers undergoing military relevant training. Abstract presented at the 26th Army Science Conference, Orlando, FL, December 1-4, 2008.
120. **Killgore, WD** & Yurgelun-Todd, DA. Cerebral correlates of amygdala responses during non-conscious perception of affective faces in adolescent children. Abstract presented at the 37th Annual Meeting of the International Neuropsychological Society, Atlanta, GA, February 11-14, 2009.
121. **Killgore, WD**, Killgore, DB, Grugle, NL, & Balkin, TJ. Odor identification ability predicts executive function deficits following sleep deprivation. Abstract presented the 37th Annual Meeting of the International Neuropsychological Society, Atlanta, GA, February 11-14, 2009.
122. **Killgore, WD**, Rupp, TL, Killgore, DB, Grugle, NL, and Balkin, TJ. Differential effects of stimulant medications on verbal and nonverbal fluency during sleep deprivation. Abstract presented the 37th Annual Meeting of the International Neuropsychological Society, Atlanta, GA, February 11-14, 2009.
123. **Killgore, WD**, Killgore, DB, Kamimori, GH, & Balkin, TJ. When being smart is a liability: More intelligent individuals may be less resistant to sleep deprivation. Abstract presented the 37th Annual Meeting of the International Neuropsychological Society, Atlanta, GA, February 11-14, 2009.
124. **Killgore, WD**, Britton, JC, Price, LM, Gold, AL, Deckersbach, T, & Rauch, SL. Introversion is associated with greater amygdala and insula activation during viewing of masked affective stimuli. Abstract presented the 37th Annual Meeting of the International Neuropsychological Society, Atlanta, GA, February 11-14, 2009.
125. **Killgore, WD**, Britton, JC, Price, LM, Gold, AL, Deckersbach, T, & Rauch, SL. Amygdala responses of specific animal phobics do not differ from healthy controls during masked fearful face perception. Abstract presented the 37th Annual Meeting of the International Neuropsychological Society, Atlanta, GA, February 11-14, 2009.

126. **Killgore, WD**, Britton, JC, Price, LM, Gold, AL, Deckersbach, T, & Rauch, SL. Small animal phobics show sustained amygdala activation in response to masked happy facial expressions. Abstract presented the 37th Annual Meeting of the International Neuropsychological Society, Atlanta, GA, February 11-14, 2009. [**Merit Poster Award*]
127. Price, LM, **Killgore, WD**, Britton, JC, Kaufman, ML, Gold, AL, Deckersbach, T, & Rauch, SL. Anxiety sensitivity correlates with insula activation in response to masked fearful faces in specific animal phobics and healthy subjects. Abstract presented at the Annual Conference of the Anxiety Disorders Association of America, Santa Ana Pueblo, New Mexico, March 12-15, 2009.
128. **Killgore, WD**, Britton, JC, Price, LM, Gold, AL, Deckersbach, T, & Rauch, SL. Neuroticism is inversely correlated with amygdala and insula activation during masked presentations of affective stimuli. Abstract presented at the Annual Conference of the Anxiety Disorders Association of America, Santa Ana Pueblo, New Mexico, March 12-15, 2009.
129. **Killgore, WD**, Kelley, AM, & Balkin, TJ. Development and validation of a scale to measure the perception of invincibility. Abstract presented at the Annual Conference of the Anxiety Disorders Association of America, Santa Ana Pueblo, New Mexico, March 12-15, 2009.
130. Kelly, AM, **Killgore WD**, Athy, J, & Dretsch, M. Risk propensity, risk perception, risk aversion, and sensation seeking in U.S. Army soldiers. Abstract presented at the 80th Annual Scientific Meeting of the Aerospace Medical Association, Los Angeles, CA, May 3-7, 2009.
131. Britton, JC, Stewart, SE, Price, LM, **Killgore, WD**, Jenike, MA, & Rauch, SL. The neural correlates of negative priming in pediatric obsessive-compulsive disorder (OCD). Abstract presented at the 64th Annual Scientific Meeting of the Society of Biological Psychiatry, Vancouver, Canada, May 14-16, 2009.
132. **Killgore, WD**, Killgore, DB, Kamimori, GH, & Balkin, TJ. Caffeine protects against increased risk-taking behavior during severe sleep deprivation. Abstract presented at the 23rd Annual Meeting of the Associated Professional Sleep Societies, Seattle, Washington, June 7-12, 2009.
133. Killgore, DB, **Killgore, WD**, Grugle, NL, & Balkin, TJ. Executive functions predict the ability to sustain psychomotor vigilance during sleep loss. Abstract presented at the 23rd Annual Meeting of the Associated Professional Sleep Societies, Seattle, Washington, June 7-12, 2009.
134. **Killgore, WD**, & Yurgelun-Todd, DA. Trouble falling asleep is associated with reduced activation of dorsolateral prefrontal cortex during a simple attention task. Abstract presented at the 23rd Annual Meeting of the Associated Professional Sleep Societies, Seattle, Washington, June 7-12, 2009.
135. **Killgore, WD**, Kelley, AM, & Balkin, TJ. A new scale for measuring the perception of invincibility. Abstract presented at the 12th Annual Force Health Protection Conference, Albuquerque, New Mexico, August 14-21, 2009.
136. **Killgore, WD**, Killgore, DB, Grugle, NL, & Balkin, TJ. Executive functions contribute to the ability to resist sleep loss. Abstract presented at the 12th Annual Force Health Protection

Conference, Albuquerque, New Mexico, August 14-21, 2009.

137. **Killgore, WD**, Killgore, DB, Kamimori, GH, & Balkin, TJ. Caffeine reduces risk-taking behavior during severe sleep deprivation. Abstract presented at the 12th Annual Force Health Protection Conference, Albuquerque, New Mexico, August 14-21, 2009. [****Winner Best Paper Award: Research***]
138. **Killgore, WD**, Castro, CA, & Hoge, CW. Normative data for the Evaluation of Risks Scale—Bubble Sheet Version (EVAR-B) for large scale surveys of returning combat veterans. Abstract presented at the 12th Annual Force Health Protection Conference, Albuquerque, New Mexico, August 14-21, 2009.
139. **Killgore, WD**, Castro, CA, & Hoge, CW. Combat exposure and post-deployment risky behavior. Abstract presented at the 12th Annual Force Health Protection Conference, Albuquerque, New Mexico, August 14-21, 2009.
140. **Killgore, WD**, Price, LM, Britton, JC, Simon, N, Pollack, MH, Weiner, MR, Schwab, ZJ, Rosso, IM, & Rauch, SL. Paralimbic responses to masked emotional faces in PTSD: Disorder and valence specificity. Abstract presented at the Annual McLean Hospital Research Day, January 29, 2010.
141. **Killgore, WD**, Killgore, DB, Kamimori, GH, & Balkin, TJ. Caffeine minimizes behavioral risk-taking during 75 hours of sleep deprivation. Abstract presented at the 38th Annual Meeting of the International Neuropsychological Society, Acapulco, Mexico, February 3-6, 2010.
142. **Killgore, WD** & Balkin, TJ. Vulnerability to sleep loss is affected by baseline executive function capacity. Abstract presented at the 38th Annual Meeting of the International Neuropsychological Society, Acapulco, Mexico, February 3-6, 2010.
143. **Killgore, WD**, Smith, KL, Reichardt, RM., Killgore, DB, & Balkin, TJ. Intellectual capacity is related to REM sleep following sleep deprivation. Abstract presented at the 38th Annual Meeting of the International Neuropsychological Society, Acapulco, Mexico, February 3-6, 2010.
144. **Killgore, WD** & Yurgelun-Todd, DA. Cerebral correlates of amygdala responses to masked fear, anger, and happiness in adolescent and pre-adolescent children. Abstract presented at the 38th Annual Meeting of the International Neuropsychological Society, Acapulco, Mexico, February 3-6, 2010.
145. **Killgore, WD**, Post, A, & Yurgelun-Todd, DA. Sex differences in cortico-limbic responses to images of high calorie food. Abstract presented at the 38th Annual Meeting of the International Neuropsychological Society, Acapulco, Mexico, February 3-6, 2010.
146. **Killgore, WD** & Yurgelun-Todd, DA. Self-reported insomnia is associated with increased activation within the default-mode network during a simple attention task. Abstract presented at the 38th Annual Meeting of the International Neuropsychological Society, Acapulco, Mexico, February 3-6, 2010.
147. **Killgore, WD**, Price, LM, Britton, JC, Gold, AL, Deckersbach, T, & Rauch, SL. Neural

correlates of anxiety sensitivity factors during presentation of masked fearful faces. Abstract presented at the 38th Annual Meeting of the International Neuropsychological Society, Acapulco, Mexico, February 3-6, 2010.

148. **Killgore, WD**, Grugle, NL, Conrad, TA, & Balkin, TJ. Baseline executive function abilities predict risky behavior following sleep deprivation. Abstract presented at the 24th Annual Meeting of the Associated Professional Sleep Societies, San Antonio, Texas, June 5-9, 2010.
149. **Killgore, WD**, Grugle, NL, & Balkin, TJ. Judgment of objective vigilance performance is affected by sleep deprivation and stimulants. Abstract presented at the 24th Annual Meeting of the Associated Professional Sleep Societies, San Antonio, Texas, June 5-9, 2010.
150. Killgore, DB, **Killgore, WD**, Grugle, NL, & Balkin, TJ. Resistance to sleep loss and its relationship to decision making during sleep deprivation. Abstract presented at the 24th Annual Meeting of the Associated Professional Sleep Societies, San Antonio, Texas, June 5-9, 2010.
151. Killgore DB, **Killgore, WD**, Grugle, NL, & Balkin, TJ. Subjective sleepiness and objective performance: Differential effects of stimulants during sleep deprivation. Abstract presented at the 24th Annual Meeting of the Associated Professional Sleep Societies, San Antonio, Texas, June 5-9, 2010.
152. Rupp, TL, **Killgore, WD**, & Balkin, TJ. Vulnerability to sleep deprivation is differentially mediated by social exposure in extraverts vs. introverts. Oral presentation at the “Data Blitz” section at the 24th Annual Meeting of the Associated Professional Sleep Societies, San Antonio, Texas, June 5-9, 2010.
153. Rupp, TL, **Killgore, WD**, & Balkin, TJ. Extraverts may be more vulnerable than introverts to sleep deprivation on some measures of risk-taking and executive functioning. Abstract presented at the 24th Annual Meeting of the Associated Professional Sleep Societies, San Antonio, Texas, June 5-9, 2010.
154. Rupp, TL, **Killgore, WD**, & Balkin, TJ. Vulnerability to sleep deprivation is differentially mediated by social exposure in extraverts vs. introverts. Abstract presented at the 24th Annual Meeting of the Associated Professional Sleep Societies, San Antonio, Texas, June 5-9, 2010.
155. Capaldi, VF, Guerrero, ML, & **Killgore, WD**. Sleep disorders among OIF and OEF Soldiers. Abstract presented at the 24th Annual Meeting of the Associated Professional Sleep Societies, San Antonio, Texas, June 5-9, 2010.
156. **Killgore, WD**, Killgore, DB, Kamimori, GH, & Balkin, TJ. Caffeine reduces behavioral risk-taking during sleep deprivation. Abstract presented at the 65th Annual Meeting of the Society for Biological Psychiatry, New Orleans, Louisiana, May 20-22, 2010.
157. **Killgore, WD**, Price, LM, Britton, JC, Simon, N, Pollack, MH, Weiner, MR, Schwab, ZJ, Rosso, IM, & Rauch, SL. Paralimbic responses to masked emotional faces in PTSD: Disorder and valence specificity. Abstract presented at the 65th Annual Meeting of the Society for Biological Psychiatry, New Orleans, Louisiana, May 20-22, 2010.

158. Rosso, IM, Makris, N, Britton, JC, Price, LM, Gold, AL, Deckersbach, T, **Killgore, WD**, & Rauch SL. Anxiety sensitivity correlates with insular cortex volume and thickness in specific animal phobia. Abstract presented at the 65th Annual Meeting of the Society for Biological Psychiatry, New Orleans, Louisiana, May 20-22, 2010.
159. Rupp, TL, **Killgore, WD**, & Balkin, TJ. Vulnerability to sleep deprivation is mediated by social exposure in extraverts versus introverts. Oral platform presentation at the 20th Congress of the European Sleep Research Society, Lisbon, Portugal, September 14-18, 2010.
160. **Killgore, WD**, Estrada, A, & Balkin, TJ. A tool for monitoring soldier fatigue and predicting cognitive readiness: The Sleep History and Readiness Predictor (SHARP). Abstract presented at the 27th Army Science Conference, Orlando, FL, November 29-December 2, 2010.
161. **Killgore, WD**, Kamimori, GH, & Balkin, TJ. Caffeinated gum minimizes risk-taking in soldiers during prolonged sleep deprivation. Abstract presented at the 27th Army Science Conference, Orlando, FL, November 29-December 2, 2010.
162. **Killgore, WD**, Britton, JC, Schwab, ZJ, Weiner, MR, Rosso, IM, & Rauch, SL. Exaggerated amygdala responses to masked fearful faces are specific to PTSD versus simple phobia. Oral platform presentation at the 27th Army Science Conference, Orlando, FL, November 29-December 2, 2010. [**Winner Best Paper in Neuroscience*]
163. **Killgore, WD**, Kamimori, GH, & Balkin, TJ. Sleep deprivation selectively impairs emotional aspects of cognitive functioning. Oral platform presentation at the 27th Army Science Conference, Orlando, FL, November 29-December 2, 2010.
164. Rupp, TL, **Killgore, WD**, & Balkin, TJ. Evaluation of personality and social exposure as individual difference factors influencing response to sleep deprivation. Oral platform presentation at the 27th Army Science Conference, Orlando, FL, November 29-December 2, 2010.
165. **Killgore, WD**, Britton, JC, Rosso, IM, Schwab, ZJ, Weiner, MR, & Rauch, SL. Shared and differential patterns of amygdalo-cortical activation across anxiety disorders. Abstract presented at the 49th Annual Meeting of the American College of Neuropsychopharmacology, Miami Beach, FL, December 5-9, 2010.
166. Rosso, IM, **Killgore, WD**, Britton, JC, Weiner, MR, Schwab, ZJ, & Rauch, SL. Neural correlates of PTSD symptom dimensions during emotional processing: A functional magnetic resonance imaging study. Abstract presented at the 49th Annual Meeting of the American College of Neuropsychopharmacology, Miami Beach, FL, December 5-9, 2010.
167. **Killgore, WD**, Rosso, IM, Britton, JC, Schwab, ZJ, Weiner, MR, & Rauch, SL. Cortico-limbic activation differentiates among anxiety disorders with and without a generalized threat response. Abstract presented at the McLean Hospital Research Day, January 13, 2011.
168. Weiner, MR, Schwab, ZJ, Rauch, SL, & **Killgore WD**. Personality factors predict brain responses to images of high-calorie foods. Abstract presented at the McLean Hospital Research Day, January 13, 2011.

169. Schwab, ZJ, Weiner, MR, Rauch, SL, & **Killgore, WD**. Emotional and cognitive intelligence: Support for the neural efficiency hypothesis. Abstract presented at the McLean Hospital Research Day, January 13, 2011.
170. Crowley, DJ, Covell, MJ, **Killgore, WD**, Schwab, ZJ, Weiner, MR, Acharya, D, Rosso, IM, & Silveri, MM. Differential influence of facial expression on inhibitory capacity in adolescents versus adults. Abstract presented at the McLean Hospital Research Day, January 13, 2011.
171. **Killgore, WD**, Britton, JC, Rosso, IM, Schwab, ZJ, Weiner, MR, & Rauch, SL. Similarities and differences in cortico-limbic responses to masked affect probes across anxiety disorders. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.
172. Rosso, IM, **Killgore, WD**, Britton, JC, Weiner, MR, Schwab, ZJ, & Rauch, SL. Hyperarousal and reexperiencing symptoms of post-traumatic stress disorder are differentially associated with limbic-prefrontal brain responses to threatening stimuli. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.
173. Schwab, ZJ, Weiner, MR, Rauch, SL, & **Killgore, WD**. Neural correlates of cognitive and emotional intelligence in adults. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.
174. Schwab, ZJ, Weiner, MR, Rauch, SL, & **Killgore, WD**. Cognitive and emotional intelligences: Are they distinct or related constructs? Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.
175. Schwab, ZJ, Weiner, MR, Rauch, SL, & **Killgore, WD**. Discrepancy scores between cognitive and emotional intelligence predict neural responses to affective stimuli. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.
176. **Killgore, WD**, Schwab, ZJ, Weiner, MR, & Rauch, SL. Smart people go with their gut: Emotional intelligence correlates with non-conscious insular responses to facial trustworthiness. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.
177. **Killgore, WD**, Weiner, MR, Schwab, ZJ, & Rauch, SL. Whom can you trust? Neural correlates of subliminal perception of facial trustworthiness. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.
178. Weiner, MR, Schwab, ZJ, & Rauch, SL, **Killgore, WD**. Impulsiveness predicts responses of brain reward circuitry to high-calorie foods. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.
179. Weiner, MR, Schwab, ZJ, & Rauch, SL, **Killgore, WD**. Conscientiousness predicts brain responses to images of high-calorie foods. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.

180. Crowley, DJ, Covell, MJ, **Killgore, WD**, Schwab, ZJ, Weiner, MR, Acharya, D, Rosso, IM, & Silveri, MM. Differential influence of facial expression on inhibitory capacity in adolescents versus adults. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.
181. Gruber, SA, Dahlgren, MK, **Killgore, WD**, Sagar, KA, & Racine, MT. Marijuana: Age of onset of use impacts executive function and brain activation. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.
182. **Killgore, WD**, Conrad, TA, Grugle, NL, & Balkin, TJ. Baseline executive function abilities correlate with risky behavior following sleep deprivation. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.
183. **Killgore, WD**, Grugle, NL, Killgore, DB, & Balkin, TJ. Resistance to sleep loss and decision making during sleep deprivation. Abstract presented at the 39th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 2-5, 2011.
184. **Killgore, WD**, Rosso, IM, Britton, JC, Schwab, ZJ, Weiner, MR, & Rauch, SL. Cortico-limbic activation differentiates among anxiety disorders with and without a generalized threat response. Abstract presented at the 66th Annual Meeting of the Society for Biological Psychiatry, San Francisco, CA, May 12-14, 2011. [**Blue Ribbon Finalist: Clinical/Translational*]
185. Schwab, ZJ, Weiner, MR, Rauch, SL, & **Killgore, WD**. Emotional and cognitive intelligence: Support for the neural efficiency hypothesis. Abstract presented at the 66th Annual Meeting of the Society for Biological Psychiatry, San Francisco, CA, May 12-14, 2011.
186. Weiner, MR, Schwab, ZJ, Rauch, SL, & **Killgore WD**. Personality factors predict brain responses to images of high-calorie foods. Abstract presented at the 66th Annual Meeting of the Society for Biological Psychiatry, San Francisco, CA, May 12-14, 2011.
187. **Killgore, WD**, Grugle, NL, & Balkin, TJ. Sleep deprivation impairs recognition of specific emotions. Abstract presented at the 25th Annual Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 11-15, 2011.
188. **Killgore, WD**, & Balkin, TJ. Does vulnerability to sleep deprivation influence the effectiveness of stimulants on psychomotor vigilance? Abstract presented at the 25th Annual Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 11-15, 2011.
189. Killgore, DB, **Killgore, WD**, Grugle, NJ, & Balkin, TJ. Sleep deprivation impairs recognition of specific emotions. Abstract presented at the 25th Annual Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 11-15, 2011.
190. Weiner, MR, Schwab, ZJ, & **Killgore, WD**. Daytime sleepiness is associated with altered brain activation during visual perception of high-calorie foods: An fMRI study. Abstract presented at the 25th Annual Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 11-15, 2011.

191. Schwab, ZJ, Weiner, MR, & **Killgore, WD**. Functional MRI correlates of morningness-eveningness during visual presentation of high calorie foods. Abstract presented at the 25th Annual Meeting of the Associated Professional Sleep Societies, Minneapolis, MN, June 11-15, 2011.
192. **Killgore, WD**, Weiner, MR, & Schwab, ZJ. Daytime sleepiness affects prefrontal regulation of food intake. Abstract presented at the McLean Hospital Research Day, January 11, 2012.
193. Kipman, M, Schwab ZJ, Weiner, MR, DelDonno, S, Rauch SL, & **Killgore WD**. The insightful yet bitter comedian: The role of emotional versus cognitive intelligence in humor appreciation. Abstract presented at the McLean Hospital Research Day, January 11, 2012.
194. Weber, M, & **Killgore, WD**. Gray matter correlates of emotional intelligence. Abstract presented at the McLean Hospital Research Day, January 11, 2012.
195. Schwab, ZJ, & **Killgore, WD**. Sex differences in functional brain responses to food. Abstract presented at the McLean Hospital Research Day, January 11, 2012.
196. DelDonno, S, Schwab, ZJ, Kipman M, Rauch, SL, & **Killgore, WD**. The influence of cognitive and emotional intelligence on performance on the Iowa Gambling Task. Abstract presented at the McLean Hospital Research Day, January 11, 2012.
197. Song, CH, Kizielewicz, J, Schwab, ZJ, Weiner, MR, Rauch, SL, & **Killgore, WD**. Time is of the essence: The Design Organization Test as a valid, reliable, and brief measure of visuospatial ability. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.
198. Kipman, M, Schwab, ZJ, DelDonno, S, & **Killgore, WD**. Gender differences in the contribution of cognitive and emotional intelligence to the left visual field bias for facial perception. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.
199. Kipman, M., Schwab, ZJ, Weiner, MR, DelDonno, S, Rauch, SL, & **Killgore, WD**. Contributions of emotional versus cognitive intelligence in humor appreciation. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.
200. Schwab, ZJ, & **Killgore, WD**. Disentangling emotional and cognitive intelligence. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.
201. Schwab, ZJ, & **Killgore, WD**. Sex differences in functional brain responses to food. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.
202. DelDonno, S, Schwab, ZJ, Kipman, M, Rauch, SL, & **Killgore, WD**. The influence of cognitive and emotional intelligence on performance on the Iowa Gambling Task. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA,

February 15-18, 2012.

203. **Killgore, WD**, Britton, JC, Rosso, IM, Schwab, ZJ, Weiner, MR, & Rauch, SL. Shared and unique patterns of cortico-limbic activation across anxiety disorders. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.
204. **Killgore, WD**, & Balkin, TJ. Sleep deprivation degrades recognition of specific emotions. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.
205. **Killgore, WD**, & Schwab, ZJ. Emotional intelligence correlates with somatic marker circuitry responses to subliminal cues of facial trustworthiness. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.
206. **Killgore, WD**, & Schwab, ZJ. Trust me! Neural correlates of the ability to identify facial trustworthiness. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.
207. **Killgore, WD**, Schwab, ZJ, Weiner, MR, Kipman, M, DelDonno, S, & Rauch SL. Overeating is associated with altered cortico-limbic responses to images of high calorie foods. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.
208. **Killgore, WD**, Weiner, MR, & Schwab, ZJ. Daytime sleepiness affects prefrontal regulation of food intake. Abstract presented at the 40th Annual Meeting of the International Neuropsychological Society, Montreal, CA, February 15-18, 2012.
209. Weber, M, DelDonno, S, Kipman M, Schwab, ZJ, & **Killgore WD**. Grey matter correlates of self-reported sleep duration. Abstract presented at the Harvard Medical School Research Day, Boston, MA, March 28, 2012.
210. **Killgore, WD**. Overlapping and distinct patterns of neurocircuitry across PTSD, Panic Disorder, and Simple Phobia. Abstract presented at the 32nd Annual Conference of the Anxiety Disorders Association of America, Arlington, VA, April 12-15, 2012.
211. **Killgore, WD**, Britton, JC, Rosso, IM, Schwab, ZJ, & Rauch, SL. Shared and unique patterns of cortico-limbic activation across anxiety disorders. Abstract presented at the 67th Annual Meeting of the Society of Biological Psychiatry, Philadelphia, PA, May 3-5, 2012.
212. **Killgore, WD**, Schwab, ZJ, & Rauch, SL. Daytime sleepiness affects prefrontal inhibition of food consumption. Abstract presented at the 67th Annual Meeting of the Society of Biological Psychiatry, Philadelphia, PA, May 3-5, 2012.
213. Rosso, IM, Britton, JC, Makris, N, **Killgore, WD**, Rauch SL, & Stewart ES. Impact of major depression comorbidity on prefrontal and anterior cingulate volumes in pediatric OCD. Abstract presented at the 67th Annual Meeting of the Society of Biological Psychiatry, Philadelphia, PA, May 3-5, 2012.

214. Kipman, M, Weber, M, DelDonno, S., Schwab, ZJ, & **Killgore, WD**. Morningness-Eveningness correlates with orbitofrontal gray matter volume. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.
215. Kipman, M, Schwab, ZJ, Weber, M, DelDonno, S, & **Killgore, WD**. Yawning frequency is correlated with reduced medial thalamic volume. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.
216. Weber, M, DelDonno, S, Kipman M, Schwab, ZJ, & **Killgore WD**. Grey matter correlates of daytime sleepiness. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.
217. Weber, M, DelDonno, S, Kipman M, Schwab, ZJ, & **Killgore WD**. Grey matter correlates of self-reported sleep duration. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.
218. DelDonno, S, Weber, M, Kipman M, Schwab, ZJ, & **Killgore, WD**. Resistance to insufficient sleep correlates with olfactory cortex gray matter. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.
219. DelDonno, S, Schwab, ZJ, Kipman, M, Weber, M, & **Killgore, WD**. Weekend sleep is related to greater coping and resilience capacities. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.
220. Schwab, ZJ, DelDonno, S, Weber, M, Kipman M, & **Killgore, WD**. Habitual caffeine consumption and cerebral gray matter volume. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.
221. Schwab, ZJ, & **Killgore, WD**. Daytime sleepiness affects prefrontal regulation of food intake. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.
222. **Killgore, WD**, Schwab, ZJ, DelDonno S, Kipman, M, Weber M, & Rauch, SL. Greater nocturnal sleep time is associated with increased default mode functional connectivity. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.
223. **Killgore, WD**, Kamimori, GH, & Balkin, TJ. Caffeine improves efficiency of planning and sequencing abilities during sleep deprivation. Abstract presented at the 26th Annual Meeting of the Associated Professional Sleep Societies, Boston, MA, June 9-13, 2012.
224. Sneider, JT, **Killgore, WD**, Crowley, DJ, Cohen-Gilbert, JE, Schwab, ZJ, & Silveri, MM. Inhibitory capacity in emerging adult binge drinkers: Influence of Facial Cues. Abstract presented at the 35th Annual Scientific Meeting of the Research Society on Alcoholism, San Francisco, CA, June 23-27, 2012.
225. **Killgore WD**. Multimodal neuroimaging to predict cognitive resilience against sleep loss.

Abstract presented at the DARPA Young Faculty Award 2012 Meeting, Arlington, VA, July 30-31, 2012. [****Winner Young Faculty Award in Neuroscience***]

226. Cohen-Gilbert, JE, **Killgore WD**, Crowley, DJ, Covell, MJ, Schwab, ZJ, Weiner, MR, Acharya, D, Sneider, JT, & Silveri, MM. Differential influence of safe versus threatening facial expressions on inhibitory control across adolescence and adulthood. Abstract presented at the Society for Neuroscience 2012 Meeting, New Orleans, LA, October 13-17, 2012.
227. Weber, M, DelDonno, S, Kipman M, Schwab, ZJ, & **Killgore WD**. Grey matter correlates of self-reported sleep duration. Abstract presented at the Harvard Division of Sleep Medicine Annual Poster Session, Boston, MA, September 27, 2012.
228. Weber, M, DelDonno, SR, Kipman, M, Preer, LA, Schwab ZJ, Weiner, MR, & **Killgore, WD**. The effect of morning bright light therapy on sleep, cognition and emotion following mild traumatic brain injury. Abstract presented at the 2012 Sleep Research Network Meeting, 22-23 October 2012, Bethesda, MD.
229. Sneider, JT, **Killgore, WD**, Crowley, DJ, Cohen-Gilbert, JE, Schwab, ZJ, & Silveri, MM. Inhibitory capacity in emerging adult binge drinkers: Influence of Facial Cues. Abstract presented at the Annual McLean Hospital Research Day, January 16, 2013.
230. Cohen-Gilbert, JE, **Killgore WD**, Crowley, DJ, Covell, MJ, Schwab, ZJ, Weiner, MR, Acharya, D, Sneider, JT, & Silveri, MM. Differential influence of safe versus threatening facial expressions on inhibitory control across adolescence and adulthood. Abstract presented at the Annual McLean Hospital Research Day, January 16, 2013.
231. Tkachenko, O, Schwab, ZJ, Kipman, M, DelDonno, S, Gogel, H., Preer, L, & **Killgore, WD**. Smarter women need less sleep. Abstract presented at the Annual McLean Hospital Research Day, January 16, 2013.
232. DelDonno, S, Kipman, M, Schwab, ZJ, & **Killgore, WD**. The contributions of emotional intelligence and facial perception to social intuition. Abstract presented at the Annual McLean Hospital Research Day, January 16, 2013.
233. Kipman, M, Schwab, ZJ, DelDonno, S, Weber, M, Rauch, SL, & **Killgore, WD**. The neurocircuitry of impulsive behavior. Abstract presented at the Annual McLean Hospital Research Day, January 16, 2013.
234. Preer, LA, Tkachenko, O, Gogel, H, Schwab, ZJ, Kipman, M, DelDonno, SR, Weber, M, Webb, CA, & **Killgore, WD**. Emotional intelligence as a mediator of the association between anxiety sensitivity and anxiety symptoms. Abstract presented at the Annual McLean Hospital Research Day, January 16, 2013.
235. Gogel, H, DelDonno, S, Kipman M, Preer, LA, Schwab, ZJ, Tkachenko, O, & **Killgore, WD**. Validation of the Design Organization Test (DOT) in a healthy population. Abstract presented at the Annual McLean Hospital Research Day, January 16, 2013.
236. Brennan, BP, Schwab, ZS, Athey, AJ, Ryan, EM, Pope, HG, **Killgore, WD**, Jenike, MA, &

Rauch, SL. A functional magnetic resonance imaging study of rostral anterior cingulate cortex activation in obsessive-compulsive disorder using an emotional counting stroop paradigm. Abstract presented at the Annual McLean Hospital Research Day, January 16, 2013.

237. Cohen-Gilbert, JE, Schwab, ZJ, **Killgore, WD**, Crowley, DJ, & Silveri MM. Influence of Binge Drinking on the Neural Correlates of Inhibitory Control during Emotional Distraction in Young Adults. Abstract presented at the 3rd International Conference on Applications of Neuroimaging to Alcoholism (ICANA-3), New Haven, CT, February 15-18, 2013.
238. Weber, M, & **Killgore, WD**. The interrelationship between ‘sleep credit’, emotional intelligence and mental health – a voxel-based morphometric study. Abstract presented at Harvard Medical School Psychiatry Research Day, April 10, 2013.
239. Cohen-Gilbert, JE, Schwab, ZJ, **Killgore, WD**, Crowley, DJ, & Silveri MM. Influence of Binge Drinking on the Neural Correlates of Inhibitory Control during Emotional Distraction in Young Adults. Abstract presented at Harvard Medical School Psychiatry Research Day, April 10, 2013.
240. Mundy, EA, Weber, M, Rauch, SL, **Killgore, WD**, & Rosso, IM. The relationship between subjective stress levels in childhood and anxiety as well as perceived stress as an adult. Abstract presented at Harvard Medical School Psychiatry Research Day, April 10, 2013.
241. Webb, CA, **Killgore, WD**, Britton, JC, Schwab, ZJ, Price, LM, Weiner, MR, Gold, AL, Rosso, IM, Simon, NM, Pollack, MH, & Rauch, SL. Comparing categorical versus dimensional predictors of functional response across three anxiety disorders. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.
242. Preer, LA, Tkachenko, O, Gogel, H, Schwab, ZJ, Kipman, M, DelDonno, SR, Weber, M, Webb, CA, Rauch, SL, & **Killgore, WD**. Linking Sleep Trouble to Neuroticism, Emotional Control, and Impulsiveness. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.
243. Preer, LA, Tkachenko, O, Gogel, H, Schwab, ZJ, Kipman, M, DelDonno, SR, Weber, M, Webb, CA, Rauch, SL, & **Killgore, WD**. Emotional Intelligence as a Mediator of the Association between Anxiety Sensitivity and Anxiety Symptoms. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.
244. Kipman, M, Schwab, ZJ, DelDonno, S, Weber, M, Rauch, SL, & **Killgore, WD**. The neurocircuitry of impulsive behavior. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.
245. Weber, M, **Killgore, WD**, Rosso, IM, Britton, JC, Simon, NM, Pollack, MH, & Rauch, SL. Gray matter correlates of posttraumatic stress disorder—A voxel based morphometry study. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.
246. Weber, M, Penetar, DM, Trksak, GH, DelDonno, SR, Kipman, M, Schwab, ZJ, & **Killgore, WD**. Morning blue wavelength light therapy improves sleep, cognition, emotion and brain function following mild traumatic brain injury. Abstract presented at the 68th Annual Meeting of the

Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.

247. Tkachenko, O, Schwab, ZJ, Kipman, M, Preer, LA, Gogel, H, DelDonno, SR, Weber, M, Webb, CA, Rauch, SL, & **Killgore, WD**. Difficulty in falling asleep and staying asleep linked to a sub-clinical increase in symptoms of psychopathology. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.
248. **Killgore, WD**, Schwab, ZJ, Kipman, M, DelDonno, SR, Rauch, SL, & Weber, M. Problems with sleep initiation and sleep maintenance correlate with functional connectivity among primary sensory cortices. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.
249. **Killgore, WD**, Schwab, ZJ, Kipman, M, DelDonno, SR, Rauch, SL, & Weber, M. A Couple of Hours Can Make a Difference: Self-Reported Sleep Correlates with Prefrontal-Amygdala Connectivity and Emotional Functioning. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.
250. Brennan, BP, Schwab, ZS, Athey, AJ, Ryan, EM, Pope, HG, **Killgore, WD**, Jenike, MA, & Rauch, SL. A functional magnetic resonance imaging study of rostral anterior cingulate cortex activation in obsessive-compulsive disorder using an emotional counting stroop paradigm. Abstract presented at the 68th Annual Meeting of the Society of Biological Psychiatry, San Francisco, CA, May 16-18, 2013.
251. Weber, M, & **Killgore, WD**. The interrelationship between ‘sleep credit’, emotional intelligence and mental health – a voxel-based morphometric study. Abstract presented at the SLEEP 2013 Annual Meeting, Baltimore, MD, June 1-5, 2013.
252. Weber, M, Penetar, DM, Trksak, GH, DelDonno, SR, Kipman, M, Schwab, ZJ, & **Killgore, WD**. Morning blue wavelength light therapy improves sleep, cognition, emotion and brain function following mild traumatic brain injury. Abstract presented at the SLEEP 2013 Annual Meeting, Baltimore, MD, June 1-5, 2013.
253. **Killgore, WD**, Schwab, ZJ, Kipman, M, DelDonno, SR, & Weber, M. Problems with Sleep Initiation and Sleep Maintenance Correlate with Functional Connectivity Among Primary Sensory Cortices. Abstract presented at the SLEEP 2013 Annual Meeting, Baltimore, MD, June 1-5, 2013.
254. **Killgore, WD**, Schwab, ZJ, Kipman, M, DelDonno, SR, & Weber, M. A Couple of Hours Can Make a Difference: Self-Reported Sleep Correlates with Prefrontal-Amygdala Connectivity and Emotional Functioning. Abstract presented at the SLEEP 2013 Annual Meeting, Baltimore, MD, June 1-5, 2013.
255. Tkachenko, O, Schwab, ZJ, Kipman, M, DelDonno, SR, Preer, LA, Gogel, H, Weber, M, Webb, CA, & **Killgore, WD**. Difficulty in falling asleep and staying asleep linked to a sub-clinical increase in symptoms of psychopathology. Abstract presented at the SLEEP 2013 Annual Meeting, Baltimore, MD, June 1-5, 2013.
256. Preer, LA, Tkachenko, O, Gogel, H, Schwab, ZJ, Kipman, M, DelDonno, SR, Weber, M, Webb,

CA, & **Killgore, WD**. Linking Sleep Initiation Trouble to Neuroticism, Emotional Control, and Impulsiveness. Abstract presented at the SLEEP 2013 Annual Meeting, Baltimore, MD, June 1-5, 2013.

257. **Killgore, WD**. Sleep duration contributes to cortico-limbic functional connectivity, emotional functioning, & psychological health. Abstract presented at the 52nd Annual Meeting of the American College of Neuropsychopharmacology, Hollywood, FL, December 8-12, 2013.
258. Preer, L, Tkachenko, O, Gogel, H, Bark, JS, Kipman, M, Olson, EA, & **Killgore, WD**. The role of personality in sleep initiation problems. Abstract presented at the Annual McLean Hospital Research Day, January 22, 2014.
259. Demers, LA, Olson, EA, Weber, M, Divatia, S, Preer, L, & **Killgore, WD**. Paranoid traits are related to deficits in complex social decision-making and reduced superior temporal sulcus volume. Abstract presented at the Annual McLean Hospital Research Day, January 22, 2014.
260. Tkachenko, O, Weber, M, Gogel, H, & **Killgore, WD**. Predisposition towards unhealthy foods linked with increased gray matter in the cerebellum. Abstract presented at the Annual McLean Hospital Research Day, January 22, 2014.
261. Olson, EA, Weber, M, Tkachenko, O, & **Killgore, WD**. Daytime sleepiness is associated with decreased integration of remote outcomes on the IGT. Abstract presented at the Annual McLean Hospital Research Day, January 22, 2014.
262. Cui, J, Tkachenko, O, & **Killgore, WD**. Can the activation of anterior cingulate predict the emotional suppression? An fMRI study with masked faces. Abstract presented at the Annual McLean Hospital Research Day, January 22, 2014.
263. Gogel, H, & **Killgore WDS**. A psychometric validation of the Design Organization Test (DOT) in a healthy sample. Abstract presented at the 42nd Annual Meeting of the International Neuropsychological Society, Seattle WA, February 12-15, 2014.
264. **Killgore, WD**, Kipman, M, Tkachenko, O, Gogel, H., Preer, L, Demers, LA, Divatia, SC, Olson, EA, & Weber, M. Predicting resilience against sleep loss with multi-modal neuroimaging. Abstract presented at the 42nd Annual Meeting of the International Neuropsychological Society, Seattle WA, February 12-15, 2014.
265. **Killgore, WD**, Weber, M, Bark, JS, Kipman, M, Gogel, H, Preer, L, Tkachenko, O, Demers, LA, Divatia, SC, & Olson, EA. Physical exercise correlates with hippocampal volume in healthy adults. Abstract presented at the 42nd Annual Meeting of the International Neuropsychological Society, Seattle WA, February 12-15, 2014.
266. **Killgore, WD**, Tkachenko, O, Weber, M, Kipman, M, Preer, L, Gogel, H, & Olson, EA. The association between sleep, functional connectivity, and emotional functioning. Abstract presented at the 42nd Annual Meeting of the International Neuropsychological Society, Seattle WA, February 12-15, 2014.
267. Preer, L, Tkachenko, O, Gogel, H, Bark, JS, Kipman, M, Olson, EA, & **Killgore, WD**. The role

of personality in sleep initiation problems. Abstract presented at the 42nd Annual Meeting of the International Neuropsychological Society, Seattle WA, February 12-15, 2014.

268. Tkachenko, O, Weber, M, Olson, EA, Gogel, H, Preer, LA, Divatia, SC, Demers, LA, & **Killgore, WD**. Gray matter volume within the medial prefrontal cortex correlates with behavioral risk taking. Abstract presented at the 42nd Annual Meeting of the International Neuropsychological Society, Seattle WA, February 12-15, 2014.
269. Olson, EA, Weber, M, Bark JS, Demers L, Divatia, SC, Gogel, H, Kipman M, Preer, L, Tkachenko, O, & **Killgore, WD**. Sex differences in threat evaluation of emotionally neutral faces. Abstract presented at the 42nd Annual Meeting of the International Neuropsychological Society, Seattle WA, February 12-15, 2014.
270. Cui, J, Tkachenko, O, & **Killgore, WD**. Can the activation of anterior cingulate predict the emotional suppression? An fMRI study with masked faces. Abstract presented at the 36nd Annual Conference of the Anxiety Disorders Association of America, Chicago, IL, March 27-30, 2014.
271. Webb, CA, Weber, M, Mundy, EA, & **Killgore, WD**. Reduced gray matter volume in the anterior cingulate, orbitofrontal cortex and thalamus as a function of depressive symptoms: A voxel-based morphometric analysis. Abstract presented at the 36nd Annual Conference of the Anxiety Disorders Association of America, Chicago, IL, March 27-30, 2014.
272. Weber, M, Penetar, DM, Trksak, GH, Kipman, M, Tkachenko, O, Bark, JS, Jorgensen, AL, Rauch, SL, & **Killgore, WD**. Light therapy may improve sleep and facilitate recovery from mild traumatic brain injury. Abstract presented at the 10th World Congress on Brain Injury, San Francisco, CA, March 19-22, 2014.
273. Cui, J, Tkachenko, O, & **Killgore, WD**. Can the activation of anterior cingulate predict the emotional suppression? An fMRI study with masked faces. Abstract presented at the 21st Annual Meeting of the Cognitive Neuroscience Society, Boston, MA, April 5-8, 2014.
274. Divatia, S, Demers, LA, Preer, L, Olson, EA, Weber, M, & **Killgore, WD**. Advantageous decision making linked with increased gray matter volume in the ventromedial prefrontal cortex. Abstract presented at the 21st Annual Meeting of the Cognitive Neuroscience Society, Boston, MA, April 5-8, 2014.
275. Demers, LA, Olson, EA, Weber, M, Divatia, S, Preer, L, & **Killgore, WD**. Paranoid traits are related to deficits in complex social decision making and reduced superior temporal sulcus volume. Abstract presented at the 21st Annual Meeting of the Cognitive Neuroscience Society, Boston, MA, April 5-8, 2014.
276. Preer, LA, Weber, M, Tkachenko, O, Divatia, S, Demers, LA, Olson, EA, & **Killgore, WD**. Gray matter volume in the amygdala is associated with facial assessments of trustworthiness. Abstract presented at the 21st Annual Meeting of the Cognitive Neuroscience Society, Boston, MA, April 5-8, 2014.
277. Tkachenko, O, Weber, M, Gogel, H, & **Killgore, WD**. Predisposition towards unhealthy foods

linked with increased gray matter volume in the cerebellum. Abstract presented at the 21st Annual Meeting of the Cognitive Neuroscience Society, Boston, MA, April 5-8, 2014.

278. Olson, EA, Weber, M, Gogel, H, & **Killgore, WD**. Daytime sleepiness is associated with decreased integration of remote outcomes on the IGT. Abstract presented at the 21st Annual Meeting of the Cognitive Neuroscience Society, Boston, MA, April 5-8, 2014.
279. Demers, LA, Preer, LA, Gogel, H, Olson, EA, Weber, M, & **Killgore, WD**. Left-hemifield bias on sad chimeric face task correlates with interpersonal emotional intelligence. Abstract presented at the 69th Annual Meeting of the Society of Biological Psychiatry, New York, NY, May 8-10, 2014.
280. Weber, M, **Killgore, WD**, Olson, EA, Rosso, IM, & Rauch, SL. Morphological brain network organization in relation to trauma and posttraumatic stress disorder. Abstract presented at the 69th Annual Meeting of the Society of Biological Psychiatry, New York, NY, May 8-10, 2014.
281. Divatia, S, Demers, LA, Preer, L, Gogel, H, Kipman, M, & **Killgore, WD**. Schizotypal and manic traits are associated with poorer perception of emotions in healthy individuals. Abstract presented at the 69th Annual Meeting of the Society of Biological Psychiatry, New York, NY, May 8-10, 2014.
282. **Killgore, WD**, Weber, M, Olson, EA, & Rauch, SL. Sleep reduction and functioning of the emotion regulation circuitry. Abstract presented at the 69th Annual Meeting of the Society of Biological Psychiatry, New York, NY, May 8-10, 2014. [**Blue Ribbon Finalist for Top Poster Award: Basic Neuroscience*]
283. Webb, CA, Weber, M, Mundy, EA, & **Killgore, WD**. Reduced gray matter volume in the anterior cingulate, orbitofrontal cortex and thalamus as a function of depressive symptoms: A voxel-based morphometric analysis. Abstract presented at the 69th Annual Meeting of the Society of Biological Psychiatry, New York, NY, May 8-10, 2014.
284. Marin MF, Song H, Landau AJ, Lasko NB, Foy Preer LA, Campbell A, Pace-Schott EF, **Killgore WD**, Orr SP, Pitman RK, Simon NM, Milad MR (2014). Psychophysiological and Neuroimaging Correlates of Fear Extinction Deficits Across Anxiety Disorders. Abstract presented at the 69th Annual Meeting of the Society of Biological Psychiatry, New York, NY, May 8-10, 2014.
285. **Killgore, WD**. The effects of sleep loss on food preference. Abstract presented at SLEEP 2014, Minneapolis, MN, May 31-June 4, 2014.
286. Weber, M, & **Killgore, WD**. Sleep habits reflect in functional brain network organization. Abstract presented at SLEEP 2014, Minneapolis, MN, May 31-June 4, 2014. [**2014 AASM Young Investigator Award, Honorable Mention*]
287. Freed, MC, Novak, LA, **Killgore, WD**, Koehlmoos, TP, Ginsberg, JP, Krupnick, J, Rauch S, Rizzo, A, Engle, CC. DoD IRB delays: Do they really matter? And if so, why and for whom? Abstract presented at the Military Health System Research Symposium, Fort Lauderdale, FL, August 18-21, 2014.

288. Freed, MC, Novak, LA, **Killgore, WD**, Koehlmoos, TP, Ginsberg, JP, Krupnick, J, Rauch S, Rizzo, A, Engle, CC. DoD IRB delays: Do they really matter? And if so, why and for whom? Abstract presented at the AMSUS Annual Meeting, Washington DC, December 2-5, 2014.
289. **Killgore, WD**, Demers, LA, Olson, EA, Rosso, IM, Webb, CA, & Rauch, SL. Anterior cingulate gyrus and sulcus thickness: A potential predictor of remission following internet-based cognitive behavioral therapy for major depressive disorder. Abstract presented at the 53rd Annual Meeting of the American College of Neuropsychopharmacology, Phoenix, AZ, December 7-11, 2014.
290. Olson, EA, Buchholz, J, Rosso, IM, **Killgore, WD**, Webb, CA, Gogel, H, & Rauch, SL. Internet-based cognitive behavioral therapy effects on symptom severity in major depressive disorder: preliminary results from a randomized controlled trial. Abstract presented at the 53rd Annual Meeting of the American College of Neuropsychopharmacology, Phoenix, AZ, December 7-11, 2014.
291. Brennan, B, Tkachenko, O, Schwab, Z, Ryan, E, Athey, A, Pope, H, Dougherty, D, Jenike, M, **Killgore, WD**, Hudson, J, Jensen, E, & Rauch SL. Abstract presented at the 53rd Annual Meeting of the American College of Neuropsychopharmacology, Phoenix, AZ, December 7-11, 2014.
292. Alkozei, A, Pisner, D, & **Killgore, WD**. Emotional intelligence is differentially correlated with prefrontal cortical responses to backward masked fearful and angry faces. Abstract presented at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.
293. Alkozei, A, Schwab, Z, & **Killgore, WD**. Looking for evil intent: Emotional intelligence and the use of socially relevant facial cues during an emotional decision making task. Abstract presented at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.
294. Shane, BR, Alkozei, A, & **Killgore, WD**. The contribution of general intelligence and emotional intelligence to the ability to appreciate humor. Abstract presented at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.
295. Markowski, SM, Alkozei, A, & **Killgore, WD**. Sleep onset latency and duration are associated with self-perceived invincibility. Abstract presented at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.
296. Pisner, D, Alkozei, A, & **Killgore, WD**. Visuospatial reasoning mediates the relationship between emotion recognition and emotional intelligence. Abstract presented at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.
297. Vanuk, JR, Fridman, A, Demers, LA, Divatia, S, & **Killgore, WD**. Engaging in meditation and internet based training as a means of enhancing emotional intelligence. Abstract presented at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.
298. Vanuk, JR, Divatia, S, Demers, LA, Markowski, SM, & **Killgore, WD**. Napping in conjunction

with brief internet-based training as a means of enhancing emotional intelligence. Abstract presented at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.

299. Cui, J, Tkachenko, O, Gogel, H, Kipman, M, Preer, LA, Weber, M, Divatia, SC, Demers, LA, Olson, EA, Buchholz, JL, Bark, JS, Rosso, IM, Rauch, SL, & **Killgore, WD**. Fractional Anisotropy of frontoparietal connections predicts individual resistance to sleep deprivation. Abstract presented at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.
300. **Killgore, WD**, Olson, EA, Weber, M, Rauch, SL, & Nickerson, LD. Emotional intelligence is associated with coordinated resting state activity between emotion regulation and interoceptive experience networks. Abstract presented at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.
301. **Killgore, WD**, Demers, LA, Divatia, S, Kipman, M, Tkachenko, O, Weber, M, Preer, LA, Gogel, H, Olson, EA, Vanuk, JR, & Rauch, SL. Enhancing emotional intelligence via brief internet-based training. Abstract presented at the 43rd Annual Meeting of the International Neuropsychological Society, Denver, CO, February 4-7, 2015.
302. Buchholz, JL, Rosso, IM, Olson, EA, **Killgore, WD**, Fukunaga, R, Webb, CA, & Rauch, SL. Internet-based cognitive behavioral therapy is associated with symptom reduction and cognitive restructuring in adults with major depressive disorder. Abstract presented at the Anxiety and Depression Conference, Miami, FL, April 9-12, 2015.
303. Alkozei, A, Pisner, D, Rauch, SL, & **Killgore, WD**. Emotional intelligence and subliminal presentations of social threat. Abstract presented at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.
304. Shane, BR, Alkozei, A, Vanuk, JR, Weber, M, & **Killgore, WD**. The effect of bright light therapy for improving sleep among individuals with mild traumatic brain injury. Abstract presented at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.
305. Vanuk, JR, Shane, BR, Alkozei, A, & **Killgore, WD**. Trait emotional intelligence is associated with greater resting state functional connectivity within the default mode and task positive networks. Abstract presented at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.
306. Vanuk, JR, Fridman, A, Demers, LA, & **Killgore, WD**. Engaging in meditation and internet-based training as a means of enhancing emotional intelligence. Abstract presented at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.
307. Pisner, D, Alkozei, A, & **Killgore, WD**. Trait emotional suppression is associated with decreased activation of the insula and thalamus in response to masked angry faces. Abstract presented at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.

308. Markowski, SM, Alkozei, A, & **Killgore, WD**. The trait of neuroticism predicts neurocognitive performance in healthy individuals. Abstract presented at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.
309. Buchholz, JL, Rosso, IM, **Killgore, WD**, Fukunaga, R, Olson, EA, Demers, LA, & Rauch, SL. Amygdala volume is associated with helplessness in adults with major depressive disorder (MDD). Abstract presented at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.
310. Sneider, JT, **Killgore, WD**, Rauch, SL, Jensen, JE, & Silveri, MM. Sex differences in the associations between prefrontal GABA and resistance to sleep deprivation. Abstract presented at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.
311. **Killgore, WD**, Rosso, IM, Rauch, SL, & Nickerson, LD. Emotional intelligence correlates with coordinated resting state activity between brain networks involved in emotion regulation and interoceptive experience. Abstract presented at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.
312. **Killgore, WD**, Demers, LA, Divatia, S, Rosso, IM, & Rauch, SL. Boosting Emotional intelligence with a brief internet-based program. Abstract presented at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.
313. **Killgore, WD**, Vanuk, JR, Alkozei, A, Markowski, SM, Pisner, D, Shane, BR, Fridman, A, & Knight, SA. Greater daytime sleepiness correlates with altered thalamocortical connectivity. Abstract presented at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.
314. **Killgore, WD**, Tkachenko, O, Gogel, H, Kipman, M, Sonis, LA, Divatia, SC, Demers, LA, Olson, EA, Buchholz, JL, Rosso, IM, & Rauch, SL. Activation of the ventral striatum predicts overeating during subsequent sleep loss. Abstract presented at the 70th Annual Meeting of the Society of Biological Psychiatry, Toronto, Ontario, CA, May 14-16, 2015.
315. Alkozei, A, Markowski, SM, Shane, BR, Rauch, SL, & **Killgore, WD**. Emotional resilience is not associated with increased emotional resistance to sleep deprivation. Abstract presented at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.
316. Alkozei, A, Pisner, D, Markowski, SM, Rauch, SL, & **Killgore, WD**. The effect of emotional resilience on changes in appetite for high-sugary food during sleep loss. Abstract presented at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.
317. Markowski, SM, Alkozei, A, Rauch, SL, & **Killgore, WD**. Self-perceived invincibility is associated with sleep onset latency and duration. Abstract presented at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.
318. Markowski, SM, Alkozei, A, Rauch, SL, & **Killgore, WD**. Sex differences in the association between personality and resistance to sleep deprivation. Abstract presented at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.

319. Shane, BR, Alkozei, A, & **Killgore, WD**. Physical exercise may contribute to vulnerability to sleep deprivation. Abstract presented at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.
320. Cui, J, Tkachenko, O, Gogel, H, Kipman, M, Sonis, LA, Weber, M, Divatia, SC, Demers, LA, Olson, EA, Buchholz, JL, Rosso, IM, Rauch, SL, & **Killgore, WD**. Resistance to sleep deprivation involves greater functional activation and white matter connectivity within a fronto-parietal network. Abstract presented at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.
321. Vanuk, JR, Rosso, IM, Rauch, SL, Alkozei, A, Markowski, SM, Pisner, D, Shane, BR, Fridman A, Knight, SA, & **Killgore, WD**. Daytime sleepiness is associated with altered thalamocortical connectivity. Abstract presented at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.
322. Sneider, JT, Jensen JE, Silveri, MM, & **Killgore, WD**. Prefrontal GABA predicts resistance to sleep deprivation. Abstract presented at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.
323. **Killgore, WD**, Tkachenko, O, Gogel, H, Kipman, M, Sonis, LA, Weber, M, Divatia, SC, Demers, LA, Olson, EA, Buchholz, JL, Rosso, IM, & Rauch, SL. Individual differences in rested activation of the ventral striatum predict overeating during sleep deprivation. Abstract presented at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.
324. **Killgore, WD**, Tkachenko, O, Rosso, IM, Rauch, SL, & Nickerson, LA. Multimodal neuroimaging to predict resistance to sleep deprivation. Abstract presented at the SLEEP 2015 Meeting, Seattle, WA, June 6-10, 2015.
325. Nickerson, LD & **Killgore, WD**. Resting state brain circuits underpinning a neurobiological model of Theory of Mind and Mentalizing. Abstract presented at the Organization for Human Brain Mapping Annual Meeting, 2015, Honolulu, HI, June 14-18, 2015.
326. Rosso, IM, Olson, EA, **Killgore WD**, Fukunaga, R, Webb, CA, & Rauch SL. A randomized trial of internet-based cognitive behavioral therapy for major depressive disorder. Abstract presented at the 54th Annual Meeting of the American College of Neuropsychopharmacology, Hollywood, FL, December 6-10, 2015.
327. Alkozei, A & **Killgore, WD**. Exposure to blue wavelength light is associated with increased dorsolateral prefrontal cortex responses during a working memory task. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
328. Klimova, A, Pisner, D & **Killgore, WD**. Neural correlates of cognitive and emotional impairments in acute versus chronic mild traumatic brain injury: a diffusion tensor imaging study. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
329. Markowski, S, Alkozei, A, & **Killgore, WD**. Greater neuroticism predicts higher performance in immediate memory, language, and attention in healthy individuals. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.

- 330. Alkozei, A & **Killgore, WD**. Exposure to blue wavelength light suppresses anterior cingulate cortex activation in response to uncertainty during anticipation of negative or positive stimuli. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
- 331. Smith, R, Alkozei, A, Bao, J, & **Killgore, WD**. Successful goal-directed memory suppression is associated with increased inter-hemispheric coordination between right and left fronto-parietal control networks. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
- 332. Singh, P, Fridman, A, Pisner, D, Singh, A, & **Killgore, WD**. A voxel based morphometric analysis of ventromedial prefrontal cortex volume related with executive function task performance post mild traumatic injury. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
- 333. **Killgore, WD**. Baseline responsiveness of the ventral striatum predicts overeating during subsequent sleep deprivation. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
- 334. **Killgore, WD** & Nickerson, LD. Predicting resistance to sleep deprivation using multimodal neuroimaging. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
- 335. Sneider, J, Jensen, JE, Silveri, MM, & **Killgore, WD**. Prefrontal GABA correlates with the ability to sustain vigilance during sleep deprivation. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
- 336. Buchholz, JL, Olson, EA, Fukunaga, R, Webb, CA, **Killgore, WD**, Rauch, SL, & Rosso, IM. Expressive suppression is associated with greater lateral orbitofrontal cortex volume in adults with major depressive disorder. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
- 337. Fridman, A, Pisner, D, Singh, P, & **Killgore, WD**. Gray matter volume in left medial prefrontal cortex is related to life satisfaction in individuals with mild traumatic brain injury. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
- 338. Singh, P, Pisner, D, Fridman, A, Roberts, S, & **Killgore, WD**. Volumetric differences in gray matter in healthy versus overweight/obese individuals post mild traumatic brain injury: A voxel based morphometric study. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
- 339. **Killgore, WD** & Weber, M. Blue wavelength light therapy reduces daytime sleepiness following mild traumatic brain injury. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
- 340. **Killgore, WD**, Weber, M, & Penetar, D. Blue wavelength light therapy improves balance

following mild traumatic brain injury. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.

341. Pisner, D, Smith, R, Alkozei, A, Klimova, A, & **Killgore, WD**. Highways of the emotional intellect: White matter microstructural correlates of an ability-based measure of emotional intelligence. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
342. Vanuk, JR, Smith, R, Knight, S, & **Killgore, WD**. Resting RSA correlates with coordinated resting state activity between brain networks involved in emotion perception. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
343. Vanuk, JR, Alkozei, A, Markowski, S, & **Killgore WD**. Greater resting state functional connectivity within the default mode and task positive networks is associated with trait emotional intelligence. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
344. Fukunaga, R, Webb, CA, Olson, EA, **Killgore, WD**, Rauch, SL, & Rosso, IM. Reduced rostral anterior cingulate volume is associated with greater frequency of negative automatic thoughts in adults with major depressive disorder. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
345. Olson, EA, Fukunaga, R., Webb, CA, Rosso, IM, **Killgore, WD**, & Rauch, SL. Delay discounting and anhedonia are independently associated with suicidal ideation in depression. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
346. Pisner, D, Singh, P, Fridman, A, & **Killgore, WD**. Resilience following mild traumatic brain injury is associated with gray matter volume in the left precentral gyrus. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
347. Sing, P, Fridman, A, Pisner, D, & **Killgore, WD**. Time dependent differences in gray matter volume in individuals post mild traumatic brain injury: A voxel based morphometric study. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
348. Smith, C, Smith, R, Sanova, A, & **Killgore, WD**. The neural basis of emotional working memory and its relation to adaptive emotional functioning. Abstract presented at the 44th Annual Meeting of the International Neuropsychological Society, Boston, MA, February 3-6, 2016.
349. Quan, M, Gruber, SA, Lukas, SE, Hill, KP, **Killgore, WD**, & Nickerson, LD. Altered functional connectivity within large-scale brain networks during a cognitive task in chronic marijuana smokers. Abstract presented at the Harvard Psychiatry Research Day, Boston, MA, March 23, 2016. [**Semi Finalist Poster: Harvard Medical School Mysell Award*]
350. Fukunaga, R, Webb, CA, Olson, EA, **Killgore, WD**, Rauch, SL, & Rosso, IM. Improvement in

negative automatic thoughts as a mediator of symptom improvement in internet-based cognitive behavioral therapy for major depressive disorder. Abstract presented at the 2016 Meeting of the Anxiety and Depression Association of America, Philadelphia, PA, March 31-April 3, 2016.

351. Bernstein, AS, Pisner, D, Klimova, A, Umapathy, L, Do, L, Squire, S, **Killgore, WD**, & Trouard, T. Effects of multiband acceleration on high angular resolution diffusion imaging data collection, processing, and analysis. Abstract presented at the 24th Annual Meeting of the International Society for Magnetic Resonance in Medicine (IMSRM), Singapore, May 7-8, 2016.
352. Alkozei, A, Markowski, SM, Pisner, D, Fridman, A, Shane, BR, Vanuk, JR, Knight, SA, & **Killgore, WD**. Exposure to blue wavelength light reduces activation within the anterior cingulate cortex during anticipation of certain reward stimuli. Abstract presented at the 71st Annual Scientific Convention of the Society for Biological Psychiatry, Atlanta, GA, May 12-14, 2016.
353. Alkozei, A., Pisner, D, Markowski, SM, Vanuk, JR, Fridman, A, Shane, BR, Knight SA, & **Killgore, WD**. Increases in prefrontal activation after exposure to blue versus amber wavelength light during cognitive load. Abstract presented at the 71st Annual Scientific Convention of the Society for Biological Psychiatry, Atlanta, GA, May 12-14, 2016.
354. Pisner, DA, Smith, R, Alkozei, A, Klimova, A, Millan, M, & **Killgore, WD**. Highways of the emotional intellect: White matter microstructural correlates of an ability-based measure of emotional intelligence. Abstract presented at the 71st Annual Scientific Convention of the Society for Biological Psychiatry, Atlanta, GA, May 12-14, 2016.
355. Singh, P, Pisner, D, Fridman, A, Singh A, Millan, M, & **Killgore, WD**. A voxel based morphometric analysis of ventromedial prefrontal cortex volume related with executive function task performance post mild traumatic brain injury. Abstract presented at the 71st Annual Scientific Convention of the Society for Biological Psychiatry, Atlanta, GA, May 12-14, 2016.
356. Smith, R, Smith, C, Khodr, O, Nettles, M, Sanova, A, & **Killgore, WD**. Emotional working memory: A relatively unexplored aspect of emotional and cognitive ability. Abstract presented at the 71st Annual Scientific Convention of the Society for Biological Psychiatry, Atlanta, GA, May 12-14, 2016.
357. Smith, R, Nettles, M, Khodr, O, Sanova, A, Smith, C, Alkozei, A, & **Killgore, WD**. Conflict-related dorsomedial frontal activation during healthy food decisions is associated with increased cravings for high-fat foods. Abstract presented at the 71st Annual Scientific Convention of the Society for Biological Psychiatry, Atlanta, GA, May 12-14, 2016.
358. Smith, R, Sanova, A, Nettles, M, Khodr, O, Smith, C, Alkozei, A, Lane, RD, & **Killgore, WD**. Unwanted reminders: The effects of emotional memory suppression on later neuro-cognitive processing. Abstract presented at the 71st Annual Scientific Convention of the Society for Biological Psychiatry, Atlanta, GA, May 12-14, 2016.
359. **Killgore, WD**, Weber, M, Palmer, W, & Penetar, D. Blue wavelength light therapy improves balance following mild traumatic brain injury. Abstract presented at the 71st Annual Scientific Convention of the Society for Biological Psychiatry, Atlanta, GA, May 12-14, 2016.

360. **Killgore, WD**, Tkachenko, O, Palmer, W, & Rauch, SL. Default mode activation predicts vulnerability to sleep deprivation in domains of mood, sleepiness, and vigilance. Abstract presented at the 71st Annual Scientific Convention of the Society for Biological Psychiatry, Atlanta, GA, May 12-14, 2016.
361. Alkozei, A, Markowski, SM, Pisner, D, Fridman, A, Shane, BR, Vanuk, JR, Knight, SA, Grandner, MA, & **Killgore, WD**. Exposure to blue wavelength light reduces activation within the anterior cingulate cortex during anticipation of certain reward stimuli. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
362. Alkozei, A, Pisner, D, Markowski, SM, Vanuk, JR, Fridman, A, Shane, BR, Knight, SA, Grandner, MA, & **Killgore, WD**. Exposure to blue wavelength light is associated with increased dorsolateral prefrontal cortex responses and increases in response times during a working memory task. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
363. Davis, B, Yang, R, **Killgore, WD**, Gallagher, RA, Carrazco, Alfonso-Miller, P, Gehrels, J, & Grandner, MA. Nightmares in a community sample: Prevalence and associations with daytime function independent of poor sleep quality and depression. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
364. Fisseha, E, Havens, C, **Killgore, WD**, Gallagher, RA, Carrazco, N, Alfonso-Miller, P, Gehrels, J, & Grandner, MA. Sleep duration's important role in the relationship among difficulty concentrating, fatigue, stress, and depressed mood: Data from the SHADES study. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
365. Graham, PM, Goldstein, M, David, BM, Perlis, ML, Perfect, MM, Frye, S, **Killgore, WD**, Carrazco, N, Alfonso-Miller, P, Gehrels, J, & Grandner, MA. Longitudinal analysis of sleep duration using actigraphy and sleep diary: Stability and agreement over 8-11 months. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
366. Granados, K, Rojo-Wissar, DM, Chakravorty, S, Prather, A, Perfect, MM, Frye, S, **Killgore, WD**, Gallagher, RA, Carrazco, N, Alfonso-Miller, P, Gehrels, J, & Grandner, MA. Adverse childhood exposures associated with adult insomnia symptoms. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
367. Grandner, MA, **Killgore, WD**, Khader, W, & Perlis, ML. Positive and negative mood ratings across 24-hours. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
368. Hall, C, Forbush, S, Youngstedt, S, **Killgore, WD**, Barilla, H, Gehrels, J, Alfonso-Miller, P, Palmer, W, Carrazco, N, & Grandner, MA. Habitual sleep duration and health: A possible role

for exercise. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.

- 369. Jackson, N, Patterson, F, Seixas, A, Jean-Louis, G, **Killgore, WD**, & Grandner, MA. Using big data to determine the social, behavioral, and environmental, determinants of sleep duration in the U.S. population: Application of a machine learning approach to data from approximately 700,000 Americans. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
- 370. **Killgore, WD**, Tkachenko, O, Grandner, MA, & Rauch, SL. Default mode activation predicts vulnerability to sleep deprivation in the domains of mood, sleepiness, and vigilance. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
- 371. **Killgore, WD**, Weber, M, Grandner, MA, & Penetar, DM. Blue wavelength light therapy improves balance following mild traumatic brain injury. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
- 372. Knight, SA & Killgore, WD. Typical sleep duration is associated with constructive thinking patterns. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
- 373. Kotzin, MD, Alkozei, A, Knight, SA, Grandner, MA, & **Killgore, WD**. The effects of trait gratitude on quality of sleep, intrusiveness, of pre-sleep cognitions, and daytime energy in healthy individuals. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
- 374. Markowski, SM, Alkozei, A, McIntosh, MB, Grandner, MA, & **Killgore, WD**. Chronotype and risk-taking propensity. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
- 375. McIntosh, MB, Markowski, SM, Grandner, MA, & **Killgore, WD**. Prior-night sleep duration is negatively associated with impulsivity in women. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
- 376. Ocano, D, Jean-Louis, G, **Killgore, WD**, Gallagher, RA, Carrazco, N, Alfonso-Miller, P, Gehrels, J, & Grandner, MA. Sleep duration and decreased social support from family, friends, and significant other: Influence of insomnia and perceived stress level. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
- 377. Okuagu, A, Perlis, ML, Ellis, JA, Prather, AA, **Killgore, WD**, Gallagher, RA, Carrazco, N, Alfonso-Miller, P, Gehrels, J, & Grandner, MA. Does thinking keep people awake? Or does it matter what they are thinking about? Self-directed cognitions associated with insomnia and insufficient sleep. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.

378. Olivier, K, Gallagher, RA, **Killgore, WD**, Carrazco, N, Alfonso-Miller, P, Gehrels, J, & Grandner, MA. Development and initial validation of the Assessment of Sleep Environment: A novel inventory for describing and quantifying the impact of environmental factors on sleep. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
379. Paine, KN, Forbush, S, Ellis, J, Nowakowski, S, Newman-Smith, K, **Killgore, WD**, Gallagher, RA, Carrazco, N, Alfonso-Miller, P, Gehrels, J, & Grandner, MA. Sleep duration and satisfaction with life, health, finances and relationship. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
380. Rhee, JU, Haynes, P, Chakravorty, S, Patterson, F, **Killgore, WD**, Gallagher, RA, Carrazco, N, Alfonso-Miller, P, Gehrels, J, & Grandner, MA. Susceptibility to smoking during the day and its relationship with insomnia and sleep duration. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
381. Roberts, SE, Singh, P, Grandner, MA, & **Killgore, WD**. Later wake up time and impulsivity. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
382. Saccone, J, Davis, B, Chakravorty, S, **Killgore, WD**, Gallagher, RA, Carrazco, N, Alfonso-Miller, P, Gehrels, J, & Grandner, MA. Habitual caffeine use and motivation to consume caffeine: Associations with sleep duration, sleepiness, fatigue, and insomnia severity. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
383. Singh, A, Fridman, A, Silveri, MM, Grandner, MA, & **Killgore, WD**. Medial prefrontal GABA predicts hunger ratings during sleep deprivation for men but not women. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
384. Vanuk, JR, Alkozei, A, Smith, R, Pisner, D, Markowski, SM, Shane, BR, Fridman, A, Knight, SA, Grandner, MA, & **Killgore, WD**. Changes in heart rate variability due to light exposure predict frontoparietal connectivity. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
385. Vanuk, JR, Alkozei, A, Knight, SA, Fridman, A, Markowski, SM, Pisner, D, Shane, BR, Grandner, MA, & **Killgore, WD**. The effects of light exposure on heart rate variability predict sleepiness and vigilance. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
386. Warlick, C, Chakravorty, S, **Killgore, WD**, Gallagher, RA, Carrazco, N, Alfonso-Miller, P, Gehrels, J, & Grandner, MA. Timing of alcohol intake associated with insomnia symptoms. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
387. Waugaman, DL, Markowski, SM, Alkozei, A, Grandner, MA, & **Killgore, WD**. Chronotype and

Emotional Intelligence. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.

- 388. Weber, M, Grandner, MA, & **Killgore, WD**. Smaller gray matter volume of the visual cortex predicts vulnerability to sleep deprivation. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
- 389. Weber, M, Grandner, MA, & **Killgore, WD**. Blue wavelength light therapy reduces daytime sleepiness following mild traumatic brain injury. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
- 390. Yang, R, Ocano, D, Chakravorty, S, **Killgore, WD**, Gallagher, RA, Carrazco, N, Alfonso-Miller, P, Gehrels, J, & Grandner, MA. Relationship between insomnia and depression moderated by caffeine. Abstract presented at the 30th Annual Meeting of the Associated Professional Sleep Societies (SLEEP 2016), Denver, CO, June 11-15, 2016.
- 391. **Killgore, WD**, Vanuk, JR, Pisner, D, Penetar, DM, & Weber, M. Short wavelength light therapy facilitates recovery from mild traumatic brain injury. Abstract presented at the 2016 Military Health System Research Symposium (MHSRS), Orlando, FL, August 15-18, 2016.
- 392. **Killgore, WD**, Alkozei, A, Smith, R, Divatia, S, & Demers, L. Enhancing emotional intelligence skills with a brief internet-based program: A pilot study. Abstract presented at the 2016 Military Health System Research Symposium (MHSRS), Orlando, FL, August 15-18, 2016.
- 393. **Killgore, WD**, Rosso, IM, Olson, EA, Webb, CA, Fukunaga, R, Gogel, H, Buchholz, JL, & Rauch, SL. Efficacy of an internet-based cognitive behavior therapy program for major depression. Abstract presented at the 2016 Military Health System Research Symposium (MHSRS), Orlando, FL, August 15-18, 2016.
- 394. **Killgore, WD**, & Nickerson, LA. Linked analysis of multimodal neuroimaging identifies neural systems associated with the ability to resist sleep deprivation. Abstract presented at the 2016 Military Health System Research Symposium (MHSRS), Orlando, FL, August 15-18, 2016.
- 395. Vanuk, JR, Allen, JJB, & **Killgore, WD**. Heart rate variability during light exposure and subsequent network connectivity patterns. Abstract presented at the Annual Meeting of the Society for Psychophysiological Research, Minneapolis, MN, September 21-25, 2016.
- 396. Haberman, JT, Olson, EA, Webb, CA, **Killgore, WD**, Rauch, SL, & Rosso, IM. The relation between treatment expectancies and outcome in internet-based cognitive behavioral therapy for major depressive disorder. Abstract presented at the Association for Behavioral and Cognitive Therapies, New York, NY, October 27-30, 2016.
- 397. Rosso, IM, Olson, EA, Thomas, MO, Webb, CA, **Killgore, WD**, & Rauch, SL. Anterior cingulate cortex morphology predicts remission from major depression following internet-based cognitive behavior therapy. Abstract presented at the 55th Annual Meeting of the American College of Neuropsychopharmacology, Hollywood, FL, December 4-8, 2016.
- 398. Shane, BR, Vanuk, JR, Bajaj, S, Millan, M, **Killgore, WD**. Multimodal brain imaging in patients

receiving bright light therapy following a mild traumatic brain injury. Abstract presented at the Western Medical Research Conference, Carmel CA, January 26-28, 2017.

399. Franco, J, Millan, M, Shane, BR, Castellanos, A, **Killgore, WD**. Blue wavelength light therapy increases thalamic grey matter volume following mild traumatic brain injury. Abstract presented at the 45th Annual Meeting of the International Neuropsychological Society, New Orleans, LA, February 1-4, 2017.
400. Alkozei, A, Smith, R, Demers, LA, Divatia, S, Weber, M, Berryhill, SM, & **Killgore, WD**. Emotional intelligence can be trained via an online training program and is associated with better performance on the IGT. Abstract accepted for oral platform presentation at the 45th Annual Meeting of the International Neuropsychological Society, New Orleans, LA, February 1-4, 2017.
401. Li, H, Gruber, S, Lukas, S, Silveri, M, Hill, K, **Killgore, WD**, & Nickerson, LD. Data fusion to investigate the effect of chronic heavy marijuana use on brain structure. Abstract presented at the 2017 Harvard Psychiatry Research Day Poster Session, Boston, MA, April 12, 2017.
402. Challener, S, Alkozei, A, Fridman, A, Dormer A, & **Killgore, WD**. Higher depressive symptoms are associated with lower activation in the orbitofrontal cortex when anticipating negative stimuli in individuals with PTSD. Abstract presented at the 72nd Annual Convention of the Society for Biological Psychiatry, San Diego, CA, May 18-20, 2017.
403. Alkozei, A, Smith R, Fridman A, Dormer, A, Challener, S, & **Killgore, WD**. Neural responses to emotional stimuli in individuals with PTSD after daily morning blue light exposure. Abstract presented at the 72nd Annual Convention of the Society for Biological Psychiatry, San Diego, CA, May 18-20, 2017.
404. Alkozei, A, Smith R, Fridman, A, Dormer, A, Challener, S, & **Killgore, WD**. The role of trait gratitude on functional brain activation changes when anticipating negative events in individuals with PTSD. Abstract presented at the 72nd Annual Convention of the Society for Biological Psychiatry, San Diego, CA, May 18-20, 2017.
405. Fridman, AJ, Alkozei, A, Smith, R, Challener, S, Knight, SA, & **Killgore, WD**. Resiliency is associated with reduced activation within the retrosplenial cortex and secondary motor area for individuals with PTSD during anticipation of a negative event. Abstract presented at the 72nd Annual Convention of the Society for Biological Psychiatry, San Diego, CA, May 18-20, 2017.
406. Vanuk, JR, Millan, M, Shane, BR, Bajaj, S, & **Killgore, WD**. Blue light therapy following a mild traumatic brain injury improves MPFC-amygdala functional connectivity and mood. Abstract presented at the 72nd Annual Convention of the Society for Biological Psychiatry, San Diego, CA, May 18-20, 2017.
407. **Killgore, WD**, Shane, BR, Vanuk, JR, Franco, J, Castellanos, A, Millan, M, Grandner, MA, & Bajaj, S. Light therapy facilitates thalamo-cortical brain recovery from mild traumatic brain injury. Abstract presented at the 72nd Annual Convention of the Society for Biological Psychiatry, San Diego, CA, May 18-20, 2017.
408. Smith, R, Lane, RD, Alkozei, A, Bao J, Smith, C, Sanova, A, Nettles, M, & **Killgore, WD**.

Common and unique neural systems underlying the maintenance of emotional vs. bodily reactions to affective stimuli: the moderating role of emotional awareness. Abstract presented at the 72nd Annual Convention of the Society for Biological Psychiatry, San Diego, CA, May 18-20, 2017.

- 409. Bajaj, S, Alkozei, A & **Killgore, WD**. Effect of bright light therapy on white matter abnormalities following a mild traumatic brain injury. Abstract presented at the 72nd Annual Convention of the Society for Biological Psychiatry, San Diego, CA, May 18-20, 2017.
- 410. Alkozei, A, Smith, R, Fridman, A, Dormer A, Challener, S, Grandner, MA, & **Killgore, WD**. Daily morning blue light exposure leads to changes in functional brain responses during emotional anticipation in individuals with PTSD. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.
- 411. Gottschlich, MK, Hyman, S, Millan M, Pisner, D, Singh, A, Knight, SA, Grandner, MA, & **Killgore, WD**. Post-concussion severity is associated with sleep problems and neuropsychological status. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.
- 412. Vanuk, JR, Shane, BR, Millan, M., Bajaj, S, Grandner, MA, & **Killgore, WD**. Short-wavelength light therapy as a way of improving sleep, cognition, and functional connectivity following mild traumatic brain injury. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.
- 413. **Killgore, WD**, Shane, BR, Vanuk, JR, Franco, J, Castellanos, A, Millan, M, Grandner, MA, & Bajaj, S. Short wavelength light therapy facilitates recovery from mild traumatic brain injury. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.
- 414. **Killgore, WD**, Capaldi, VF, Balkin, TJ, & Kamimori, GH. The trait of introversion-extraversion contributes to sustained performance on planning and sequencing abilities during sleep deprivation. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.
- 415. Bajaj, S, Alkozei, A, Grandner, MA, & **Killgore, WD**. Effect of bright light therapy on brain and behavioral abnormalities following a mild traumatic brain injury. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.
- 416. Oliver, K, Gallagher, R, Hale, L, Barrett, M, Branas, C, **Killgore, WD**, Parthasarathy, S, Alfonso-Miller, P, Gehrels, J, & Grandner, MA. Development and initial validation of a brief measure of control over sleep. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.
- 417. Grandner, MA, Athey, A, **Killgore WD**, Alfonso-Miller, P. Preliminary results of a sleep health intervention in student athletes: Changes in sleep, energy level, and mental well-being, and body weight. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.
- 418. Yang, R, Gallagher, R, Hale, L, Perlis, M, Barrett, M, Branas, C, **Killgore, WD**, Parthasarathy, S, Alfonso-Miller, P, Gehrels, J, Grandner, MA. Would you call yourself a short or long sleeper? Perceptions of sleep category associated with reported sleep duration, insomnia, and health. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.

419. Fisseha, E, Gallagher, R, Hale, L, Branas, C, Barrett, M, **Killgore, WD**, Alfonso-Miller, P, Jean-Louis, G, Seixas, A, Williams, N, Gehrels, J, & Grandner, MA. Habitual weekday sleep duration associated with multiple dimensions of socioeconomic status. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.
420. Poling, K, Gallagher, R, Hale, L, Branas, C, Seixas, A, Jean-Louis, G, **Killgore, WD**, Alfonso-Miller, P, Parthasarathy, S, Gehrels, J, & Grandner, MA. Sleep partially mediates the association between food insecurity and obesity: Roles of short sleep duration, insomnia, and socioeconomic factors. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.
421. Forbush, S, Fisseha, E, Gallagher, R, Hale, L, Malone, S, Patterson, F, Branas, C, Barrett, M, **Killgore, WD**, Gehrels, J, Alfonso-Miller, P, & Grandner, MA. Sociodemographics, poor overall health, cardiovascular disease, depression, fatigue, and daytime sleepiness associated with social jetlag independent of sleep duration and insomnia. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.
422. Till, K, Athey, A, Chakravorty, S, **Killgore, WD**, Alfonso-Miller, P, Gehrels, J, & Grandner, MA. Insomnia and daytime tiredness in student athletes associated with risky behaviors and poor decision making when under the influence of alcohol. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.
423. Warlick, C, Hall, C, Athey, A, Chakravorty, S, **Killgore, WD**, Alfonso-Miller, P, Gehrels, J, & Grandner, MA. Difficulty sleeping associated with substance use among student athletes. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.
424. Jaszewski, A, Athey, A, **Killgore, WD**, Alfonso-Miller, P, Gehrels, J, & Grandner, MA. Sleep duration and quality associated with mental well-being in student athletes. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.
425. Athey, A, Alfonso-Miller, P, **Killgore, WD**, & Grandner, MA. Preliminary results of a sleep health intervention in student athletes: Perceived changes to sleep, performance, and mental and physical wellbeing. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.
426. Goel, N, Taylor, DM, Abel, T, **Killgore, WD**, Pearson-Leary, J, & Bhatnagar, S. MicroRNAs are cross-species markers of sleep loss in humans and rats. Abstract presented at the Organization for Human Brain Mapping Conference, Boston, MA, June 3-7, 2017.
427. Meridew, C, Jaszewski, A, Athey, A, Alfonso-Miller, P, **Killgore, WD**, Gehrels, J, & Grandner, MA. Impact of time and activity demands on sleep of student athletes: It's not about reduced sleep opportunity. Abstract presented at the SLEEP Meeting, Boston, MA, June 3-7, 2017.
428. Bajaj, S, Rosso, IM, Rauch, SL, & **Killgore WD**. Impact of bright light therapy on volume and cortical thickness of the brain following mild traumatic brain injury. Abstract presented at the Organization for Human Brain Mapping Conference, Vancouver, Canada, June 25-29, 2017.*[selected for travel award]
429. Bajaj, S, Rosso, IM, Rauch, SL, & **Killgore, WD**. Effect of bright light therapy on white matter

abnormalities following mild traumatic brain injury. Abstract presented at the Organization for Human Brain Mapping Conference, Vancouver, Canada, June 25-29, June 3-7, 2017.

430. Alkozei, A, Haack, M, Smith, R, Dailey, N, Bajaj, S, & **Killgore, WD**. Chronic sleep restriction increases negative implicit attitudes toward Arab Muslims. Abstract presented at the Military Health Systems Research Symposium, Kissimmee, FL, August 27-30, 2017.
431. **Killgore WD**, Vanuk, JR, Bajaj, S. Blue wavelength light therapy increases axonal myelination in mild traumatic brain injury. Abstract presented at the Military Health Systems Research Symposium, Kissimmee, FL, August 27-30, 2017.
432. **Killgore WD**. What makes a Super-Soldier: Identifying the neural correlates of individual differences in resilience against sleep deprivation. Abstract presented at the Military Health Systems Research Symposium (MHSRS), Kissimmee, FL, August 27-30, 2017.
433. Dailey, NS, Bajaj, S, Alkozei, A, & **Killgore WD**. Neural correlates of aggression during chronic and subacute stages of recovery from mild traumatic brain injury. Abstract presented at the Military Health Systems Research Symposium, Kissimmee, FL, August 27-30, 2017.
434. Bajaj, S, Alkozei, A, & **Killgore WD**. Short wavelength light therapy following mild traumatic brain injury: Can we normalize the abnormal diffusion and quantity of water within the brain? Abstract presented at the Military Health Systems Research Symposium, Kissimmee, FL, August 27-30, 2017.
435. Goel, N, Taylor, DM, Abel, T, **Killgore, WD**, Pearson-Leary, J, & Bhatnagar, S. MicroRNAs are cross-species markers of sleep loss in humans and rats. Abstract presented at the Society for Neuroscience, Washington, DC, November 11-15, 2017.
436. Dailey, NS, Bajaj, S, Alkozei, A, Smith, R, Knight, SA, & **Killgore, WD**. Neural correlates of aggression in the chronic and post-acute stages of recovery from mild traumatic brain injury: A diffusion tensor imaging study. Abstract presented at the University of Arizona Junior Investigator Poster Forum, Tucson, AZ, November 17, 2017.
437. Challener, S, Alkozei, A, Fridman, A, Dormer, A, & **Killgore, WD**. Higher depressive symptoms are associated with lower activation in the orbital frontal cortex when anticipating negative stimuli in individuals with PTSD. Abstract presented at the University of Arizona Junior Investigator Poster Forum, Tucson, AZ, November 17, 2017.
438. Alkozei, A, Smith, R, Demers, L, Divatia, S, Weber, M, Berryhill, S, & **Killgore, WD**. Emotional intelligence can be trained via an online training program and is associated with better performance on the IGT. Abstract presented at the University of Arizona Junior Investigator Poster Forum, Tucson, AZ, November 17, 2017.
439. Satterfield, B, Raikes, AC, & **Killgore, WD**. A voxel-based morphometric analysis of resilience to vigilant attention impairment during sleep deprivation. Abstract presented at the University of Arizona Junior Investigator Poster Forum, Tucson, AZ, November 17, 2017.
440. Singh, A, Thurston, MD, Gottschlich, MK, Miller, MA, & **Killgore, WD**. Trait anxiety predicts

hostile tendencies post-traumatic brain injury. Abstract presented at the University of Arizona Junior Investigator Poster Forum, Tucson, AZ, November 17, 2017.

- 441. Raikes, AC, Satterfield, BC, Knight, SA, & **Killgore, WD**. Grey matter volumetric differences with increasing numbers of previous mild traumatic brain injuries: A voxel-based morphometric study. Abstract presented at the University of Arizona Junior Investigator Poster Forum, Tucson, AZ, November 17, 2017.
- 442. Bajaj, S, Dailey, N, Alkozei, A, Vanuk, JR, & **Killgore, WD**. Preservation of limbic network structure in healthy young adults. Abstract presented at the University of Arizona Junior Investigator Poster Forum, Tucson, AZ, November 17, 2017.
- 443. Alkozei, A, **Killgore, WD**, Smith, R, Dailey, NS, Bajaj, S, & Haack, M. Chronic sleep restriction increases negative implicit attitudes toward Arab Muslims. Abstract presented at the University of Arizona Junior Investigator Poster Forum, Tucson, AZ, November 17, 2017.
- 444. Skalamera, J, Alkozei, A, Haack, M, & **Killgore, WD**. Chronic sleep restriction increases racial bias and affects actual decision-making about people. Abstract presented at the University of Arizona Junior Investigator Poster Forum, Tucson, AZ, November 17, 2017.
- 445. Alkozei, A, Smith, R, & **Killgore, WD**. Increases in prefrontal activation after exposure to blue versus amber wavelength light during cognitive load. Abstract presented at the University of Arizona Junior Investigator Poster Forum, Tucson, AZ, November 17, 2017.
- 446. Knight, SA, & **Killgore, WD**. Typical sleep duration is associated with constructive thinking patterns. Abstract presented at the University of Arizona Junior Investigator Poster Forum, Tucson, AZ, November 17, 2017.
- 447. Nickerson, L, Li, H, Smith, S, Lukas, S, Silveri, M, Hill, K, **Killgore, WD**, & Gruber, S. Combining multi-site/study MRI data: A novel linked-ICA denoising method for removing scanner and site variability from multi-modal MRI data. Abstract presented at the American College of Neuropsychopharmacology (ACNP) 56th Annual Meeting, Palm Springs, CA, December 3-7, 2017.
- 448. Bajaj, S, Raikes, AC, Dailey, NS, Vanuk, JR, Weber, M, Rosso, IM, Rauch, SL, & **Killgore, WD**. Changes in cortical structure, sleep, and anxiety symptoms following blue-wavelength light therapy in individuals with mild traumatic brain injury. Abstract presented at the Big Sky Athletic Training Sports Medicine Conference, Big Sky, MT, February 4-8, 2018.
- 449. Dailey, NS, Raikes, AC, Smith, R, Alkozei, A, & **Killgore, WD**. The executive control network after mild traumatic brain injury: Associations between functional connectivity and aggression. Abstract presented at the Big Sky Athletic Training Sports Medicine Conference, Big Sky, MT, February 4-8, 2018.
- 450. Raikes, AC, Satterfield, BC, Dailey, NS, Bajaj, S, & **Killgore, WD**. Self-reported sleep quality is related to cerebellar grey matter volume after mild traumatic brain injury. Abstract presented at the Big Sky Athletic Training Sports Medicine Conference, Big Sky, MT, February 4-8, 2018.

451. Raikes, AC, Bajaj, S, Dailey, NS, Satterfield, BC, Alkozei, A, Smith, R, & **Killgore, WD**. White matter correlates of self-reported sleep quality after a mild traumatic brain injury: A DTI study. Abstract presented at the Big Sky Athletic Training Sports Medicine Conference, Big Sky, MT, February 4-8, 2018.
452. Satterfield, BC, Raikes, AC, & **Killgore, WD**. A voxel-based morphometric analysis of resilience to vigilant attention impairment during sleep deprivation. Abstract presented at the 46th Annual Meeting of the International Neuropsychological Society, Washington, DC, February 14-17, 2018.
453. Alkozei, A, Smith, R, Dailey, NS, Bajaj, S, Knight SA, & **Killgore, WD**. Exposure to blue wavelength light during memory consolidation improves long-delay verbal memory performance. Abstract presented at the 46th Annual Meeting of the International Neuropsychological Society, Washington, DC, February 14-17, 2018.
454. Alkozei, A, Smith, R, Dailey, NS, Bajaj, S, Haack, M, & **Killgore, WD**. Men, but not Women, show a decrease in implicit preferences for low-calorie food after 3 weeks of chronic sleep restriction. Abstract presented at the 46th Annual Meeting of the International Neuropsychological Society, Washington, DC, February 14-17, 2018.
455. Alkozei, A, Smith, R, & **Killgore, WD**. A positive cognitive style mediates the relationship between trait gratitude and depressive symptoms. Abstract presented at the 46th Annual Meeting of the International Neuropsychological Society, Washington, DC, February 14-17, 2018.
456. Bajaj, S, Dailey, NS, Alkozei, A, Vanuk, JR, & **Killgore, WD**. Preservation of limbic network structure in healthy young adults. Abstract presented at the 46th Annual Meeting of the International Neuropsychological Society, Washington, DC, February 14-17, 2018.
457. Alkozei, A, Smith, R, Demers, LA, Divatia, S, Weber, M, Berryhill, SM, & **Killgore, WD**. Emotional intelligence can be trained via an online training program and is associated with better performance on the IGT. Abstract presented at the 46th Annual Meeting of the International Neuropsychological Society, Washington, DC, February 14-17, 2018.
458. Dailey, NS, Bajaj, S, Alkozei, A, Smith, R, Knight, SA, & **Killgore, WD**. Neural correlates of aggression in the chronic and post-acute stages of recovery from mild traumatic brain injury: A diffusion tensor imaging study. Abstract presented at the 46th Annual Meeting of the International Neuropsychological Society, Washington, DC, February 14-17, 2018.
459. **Killgore, WD**, Shane, BR, Vanuk, JR, Millan, M, Knight, SA, & Bajaj, S. Blue light therapy accelerates brain and cognitive recovery from mild traumatic brain injury. Abstract presented at the 46th Annual Meeting of the International Neuropsychological Society, Washington, DC, February 14-17, 2018.
460. **Killgore, WD**. Default mode activation and the ability to resist sleep deprivation. Abstract presented at the 46th Annual Meeting of the International Neuropsychological Society, Washington, DC, February 14-17, 2018.
461. **Killgore, WD**, Capaldi, VF, Balkin, TJ, & Kamimori, GH. Personality traits predict the ability to

sustain executive function abilities during sleep deprivation. Abstract presented at the 46th Annual Meeting of the International Neuropsychological Society, Washington, DC, February 14-17, 2018.

462. Raikes, AC, & **Killgore, WD**. Increased cerebellar grey matter in the presence of decreased subjective sleep quality following mild traumatic brain injury. Abstract presented at the 46th Annual Meeting of the International Neuropsychological Society, Washington, DC, February 14-17, 2018.
463. Raikes, AC, Satterfield, BC, Knight, SA, & **Killgore, WD**. Gray matter volumetric differences with increasing numbers of previous mild traumatic brain injuries: A voxel-based morphometric study. Abstract presented at the 46th Annual Meeting of the International Neuropsychological Society, Washington, DC, February 14-17, 2018.
464. Skalamera, J, Alkozei, A, Haack, M, & **Killgore, WD**. Chronic sleep restriction increases implicit racial biases and affects actual decision-making about people. Abstract presented at the 46th Annual Meeting of the International Neuropsychological Society, Washington, DC, February 14-17, 2018.
465. Huanjie, L, Silveri, M, Lukas, SE, Hill, K, **Killgore, WD**, Gruber, S, & Nickerson, LD. Data fusion to investigate multimodal MRI patterns associated with chronic heavy marijuana use. Abstract presented at the Harvard Psychiatry Day Poster Session, Boston, MA, April 4, 2018.
466. Bajaj, S, Dailey, NS, Vanuk, JR, Raikes, A, Weber, M, Rosso, IM, Rauch, SL, & **Killgore, WD**. Impact of blue light therapy on cortical volume, sleep and anxiety symptoms following mild traumatic brain injury. Abstract presented at the Anxiety and Depression Association of America (ADAA) Conference, Washington, DC, April 5-8, 2018.
467. Knight, SA, & **Killgore, WD**. Constructive thinking patterns correlate with typical sleep habits. Abstract presented at the Anxiety and Depression Association of America (ADAA) Conference, Washington, DC, April 5-8, 2018.
468. Raikes, AC, Dailey, NS, Bajaj, S, & **Killgore, WD**. White matter structure changes associated with depressive symptoms following recent mild traumatic brain injury. Abstract presented at the Anxiety and Depression Association of America (ADAA) Conference, Washington, DC, April 5-8, 2018.
469. Singh, A, Thurston, MD, Gottschlich, MK, Miller, MA, & **Killgore, WD**. Trait anxiety predicts hostile tendencies post-traumatic brain injury. Abstract presented at the Anxiety and Depression Association of America (ADAA) Conference, Washington, DC, April 5-8, 2018.
470. Bajaj, S, Raikes, AC, Alkozei, A, Dailey, NS, Satterfield, BC, Vanuk, JR, & **Killgore, WD**. Association between suicidal ideation and cortical volume in a sub-clinical sample of young individuals. Abstract presented at the Society of Biological Psychiatry 73rd Annual Meeting, New York, NY, May 10-12, 2018.
471. Challener, S, Alkozei, A, Young, A, Ozcan, M, Raikes, AC, & **Killgore, WD**. Sleep problems are associated with greater default mode network activation when anticipating negative stimuli in

individuals with PTSD. Abstract presented at the Society of Biological Psychiatry 73rd Annual Meeting, New York, NY, May 10-12, 2018.

- 472. Dailey, NS, Smith, R, Raikes, AC, Alkozei, A, & **Killgore, WD**. Reduced functional connectivity in the executive control network following mild traumatic brain injury: Implications for emotional regulation. Abstract presented at the Society of Biological Psychiatry 73rd Annual Meeting, New York, NY, May 10-12, 2018.
- 473. **Killgore, WD**, Kent, HC, Knight, SA, & Alkozei, A. Changes in morning salivary melatonin correlate with prefrontal responses during working memory performance. Abstract presented at the Society of Biological Psychiatry 73rd Annual Meeting, New York, NY, May 10-12, 2018.
- 474. **Killgore, WD**, Alkozei, A, & Weber, M. Blue light therapy improves executive function following mild traumatic brain injury. Abstract presented at the Society of Biological Psychiatry 73rd Annual Meeting, New York, NY, May 10-12, 2018.
- 475. Ozcan, M, Challener, S, Yung, A, Alkozei, A, Raikes, AC, & **Killgore, WD**. Daytime sleepiness in individuals with PTSD is associated with greater activation in the right angular gyrus when viewing negative images. Abstract presented at the Society of Biological Psychiatry 73rd Annual Meeting, New York, NY, May 10-12, 2018.
- 476. Smith, R, Sanova, A, Lane, RD, & **Killgore, WD**. Graph-theoretic correlates of trait differences in emotional awareness. Abstract presented at the Society of Biological Psychiatry 73rd Annual Meeting, New York, NY, May 10-12, 2018.
- 477. Yung, A, Challener, S, Ozcan, M, Alkozei, A, Raikes, AC, & **Killgore, WD**. Improvements in PTSD symptom severity are associated with greater activation in the hippocampus during anticipation of negative stimuli. Abstract presented at the Society of Biological Psychiatry 73rd Annual Meeting, New York, NY, May 10-12, 2018.
- 478. Satterfield, BC, Silveri, M, Alkozei, A, Raikes, AC, & **Killgore, WD**. GABA: A neural marker of resilience to psychomotor vigilance impairment during sleep deprivation. Abstract presented at the SLEEP 2018 Annual Meeting, Baltimore, MD, June 2-6, 2018. [*Trainee Merit Award]
- 479. Satterfield, BC, Alkozei, A, Raikes, AC, & **Killgore, WD**. Habitual sleep duration predicts caloric and macronutrient intake during sleep deprivation. Abstract presented at the SLEEP 2018 Annual Meeting, Baltimore, MD, June 2-6, 2018.
- 480. Bajaj, S, Raikes, A, Dailey, NS, Vanuk, JR, Satterfield, BC, Alkozei, A, Weber, M, Rosso, IM, Rauch, SL, Grandner, MA, & **Killgore, WD**. Impact of blue light therapy on cortical structure, sleep, and anxiety symptoms following mild traumatic brain injury. Abstract presented at the SLEEP 2018 Annual Meeting, Baltimore, MD, June 2-6, 2018.
- 481. Challener, S, Alkozei, A, Yung, A, Ozcan, M, Raikes, AC, & **Killgore, WD**. Functional impairment due to excessive daytime sleepiness is associated with greater activation in the default mode network when anticipating negative stimuli in individuals with PTSD. Abstract presented at the SLEEP 2018 Annual Meeting, Baltimore, MD, June 2-6, 2018.

482. **Killgore, WD**, Alkozei, A, Knight, SA, Miller, MA, Grandner, MA, & Weber, M. Daily morning blue light exposure enhances executive functioning in individuals with mild traumatic brain injury. Abstract presented at the SLEEP 2018 Annual Meeting, Baltimore, MD, June 2-6, 2018.
483. **Killgore, WD**, & Nickerson, LA. Resistance to sleep deprivation is predicted by gray matter volume in the posterior brain stem. Abstract presented at the SLEEP 2018 Annual Meeting, Baltimore, MD, June 2-6, 2018.
484. Alkozei, A, Kent, HC, Knight, SA, & **Killgore, WD**. Changes in morning salivary melatonin correlate with prefrontal responses during working memory performance. Abstract presented at the SLEEP 2018 Annual Meeting, Baltimore, MD, June 2-6, 2018.
485. Ozcan, M, Alkozei, A, Raikes, A, & **Killgore, WD**. Pre-sleep cognitions partially mediate the relationship between depression and daytime energy. Abstract presented at the SLEEP 2018 Annual Meeting, Baltimore, MD, June 2-6, 2018.
486. Raikes, AC, Dailey, NS, Satterfield, BC, Bajaj, S, & **Killgore, WD**. Self-reported sleep quality is associated with reductions in white-matter integrity following recent mild traumatic brain injury. Abstract presented at the SLEEP 2018 Annual Meeting, Baltimore, MD, June 2-6, 2018.
487. Raikes, AC, Satterfield, BC, Dailey, NS, Bajaj, S, & **Killgore, WD**. Subjectively poor sleep quality is associated with increased cerebellar grey matter volume following mild traumatic brain injury. Abstract presented at the SLEEP 2018 Annual Meeting, Baltimore, MD, June 2-6, 2018.
488. Skalamera, J, Alkozei, A, Haack, M, & **Killgore, WD**. The effect of chronic sleep restriction on implicit racial biases and explicit judgmental decision-making. Abstract presented at the SLEEP 2018 Annual Meeting, Baltimore, MD, June 2-6, 2018.
489. Sanchez, C, Hale, L, Branas, C, Gallagher, R, **Killgore, WD**, Gehrels, J, Alfonso-Miller, P, & Grandner, MA. Relationships between dietary supplement intake and sleep duration, insomnia, and fatigue. Abstract presented at the SLEEP 2018 Annual Meeting, Baltimore, MD, June 2-6, 2018.
490. Tubbs, A, Perlis, M, Chakravorty, S, Basner, M, **Killgore, WD**, Gehrels, J, Alfonso-Miller, P, & Grandner, MA. Does increased risk of suicide at night favor one method of suicide over another? Abstract presented at the SLEEP 2018 Annual Meeting, Baltimore, MD, June 2-6, 2018.
491. Huanjie, L, Gruber, S, Smith, SM, Lukas, SE, Silveri, M, Hill, KP, **Killgore, WD**, & Nickerson, LD. Combining multi-site/study MRI data: A novel linked-ICA denoising method for removing scanner and site variability from multi-modal MRI data. Abstract presented at the Joint Annual Meeting of ISMRM-ESMRMB, Paris, France, June 16-21, 2018. [*Trainee Stipend Award]
492. Bajaj, S, Raikes, AC, Alkozei, A, Dailey, NS, Vanuk, J, Satterfield, BC, & **Killgore, WD**. Suicidal ideation is associated with diminished cortical volume in a sub-clinical population. Abstract presented at the Organization for Human Brain Mapping (OHBM) Annual Meeting, Singapore, June 17-21, 2018.

493. Bajaj, S, Raikes, AC, Dailey, NS, Vanuk, J, Alkozei, A, Satterfield, BC, Weber, M, Rosso, IM, Rauch, SL, & **Killgore, WD**. Effect of blue light therapy on cortical volume, sleep, and anxiety symptoms following mild traumatic brain injury. Abstract presented at the Organization for Human Brain Mapping (OHBM) Annual Meeting, Singapore, June 17-21, 2018.
494. Dailey, NS, Bajaj, S, Smith, R, Raikes, AC, Alkozei, A, & **Killgore, WD**. Disrupted functional connectivity and elevated aggression in young adults with mild traumatic brain injury. Abstract presented at the Organization for Human Brain Mapping (OHBM) Annual Meeting, Singapore, June 17-21, 2018.
495. Raikes, AC, Bajaj, S, Dailey, NS, Alkozei, A, Smith, R, & **Killgore, WD**. Post-mTBI white matter correlates of self-reported sleep quality: A DTI study. Abstract presented at the Organization for Human Brain Mapping (OHBM) Annual Meeting, Singapore, June 17-21, 2018.
496. Nickerson, LD, Li, H, , Silveri, MM, Lukas, SE, Hill, KP, **Killgore, WD**, & Gruber, SA. Multimodal MRI data fusion reveals structure-function patterns associated with chronic heavy marijuana use. Abstract presented at the Organization for Human Brain Mapping (OHBM) Annual Meeting, Singapore, June 17-21, 2018.
497. Raikes, AC, Satterfield, BC, Alkozei, A, & **Killgore, WD**. Blue light therapy improves self-reported sleep quality in individuals with a recent mild traumatic brain injury. Abstract presented at the Military Health Systems Research Symposium, Orlando, FL, August 20-23, 2018.
498. **Killgore, WD**. Executive functioning in individuals with mild traumatic brain injury is enhanced by daily morning blue light therapy. Abstract presented at the Military Health Systems Research Symposium, Orlando, FL, August, 20-23, 2018.
499. **Killgore, WD**, & Nickerson, LA. Why can't you just stay awake? Resistance to sleep deprivation is associated with measurable differences in brainstem gray matter. Abstract presented at the Military Health Systems Research Symposium, Orlando, FL, August 20-23, 2018.
500. Dailey, NS, Smith, R, Satterfield, BC, Raikes, AC, & **Killgore, WD**. Verbal fluency following mild traumatic brain injury: The strength of switching. Abstract presented at the American Speech-Language-Hearing Association Annual Convention, Boston, MA, November 15-17, 2018.
501. Forbeck, B, Dailey, NS, Esbit, S, & **Killgore, WD**. Reduced information processing speed: A dynamic deficit in mild traumatic brain injury. Abstract presented at the American Speech-Language-Hearing Association Annual Convention, Boston, MA, November 15-17, 2018.
502. Raikes, AC, Dailey, NS, & **Killgore, WD**. Neural and neurocognitive correlates of responsiveness to blue light therapy following mild traumatic brain injury. Abstract presented at the American Speech-Language-Hearing Association Annual Convention, Boston, MA, November 15-17, 2018.
503. Burns, AI, Ozcan, M, Shepard, KC, Alkozei, A, & **Killgore, WD**. The association between PTSD severity and life satisfaction is mediated by trait gratitude. Abstract presented at the

Annual Meeting of the International Neuropsychological Society (INS), New York, NY, February 20-23, 2019.

504. Burns, AI, Shepard, KC, Ozcan, M, Alkozei, A, Vanuk, JR, & **Killgore, WD**. The association between morningness-eveningness and nightmares in PTSD. Abstract presented at the Annual Meeting of the International Neuropsychological Society (INS), New York, NY, February 20-23, 2019.
505. Dailey, NS, Meinhausen, C, & **Killgore, WD**. Self-initiated recall strategies in mild traumatic brain injury: Identifying the neural correlates. Abstract presented at the Annual Meeting of the International Neuropsychological Society (INS), New York, NY, February 20-23, 2019.
506. Esbit, S, Dailey, NS, & **Killgore, WD**. Making a list and checking it twice: Episodic verbal recall in mild traumatic brain injury. Abstract presented at the Annual Meeting of the International Neuropsychological Society (INS), New York, NY, February 20-23, 2019.
507. Esbit, S, LaFollette, K, Botello, R, Satterfield, BC, Alkozei, A, & **Killgore, WD**. High self-perceived adroitness: An altered perception of reality during sleep deprivation. Abstract presented at the Annual Meeting of the International Neuropsychological Society (INS), New York, NY, February 20-23, 2019.
508. **Killgore, WD**, Vanuk, JR, & Bajaj, S. Improving executive functioning in mild traumatic brain injury with daily morning blue light therapy. Abstract presented at the Annual Meeting of the International Neuropsychological Society (INS), New York, NY, February 20-23, 2019.
509. **Killgore, WD**, & Nickerson, LA. Vulnerability and resistance to sleep deprivation are associated with measurable differences in brainstem gray matter. Abstract presented at the Annual Meeting of the International Neuropsychological Society (INS), New York, NY, February 20-23, 2019.
510. LaFollette, K, Satterfield, BC, Lazar, M, & **Killgore, WD**. Predicting psychosocial stress reactivity from ability and trait-based emotional intelligence. Abstract presented at the Annual Meeting of the International Neuropsychological Society (INS), New York, NY, February 20-23, 2019.
511. LaFollette, K, Satterfield, BC, Lazar, M, & **Killgore, WD**. Stay negative? Positive affect is associated with increased psychosocial stress reactivity. Abstract presented at the Annual Meeting of the International Neuropsychological Society (INS), New York, NY, February 20-23, 2019.
512. Meinhausen, C, Dailey, NS, & **Killgore, WD**. Identifying memory retrieval strategies following a mild traumatic brain injury using the CVLT-II. Abstract presented at the Annual Meeting of the International Neuropsychological Society (INS), New York, NY, February 20-23, 2019.
513. Ozcan, M, Shepard, KC, Burns, AI, Alkozei, A, & **Killgore, WD**. Trait gratitude and the impact of daytime sleepiness on daily functioning predict PTSD severity over time. Abstract presented at the Annual Meeting of the International Neuropsychological Society (INS), New York, NY, February 20-23, 2019.

514. Raikes, AC, & **Killgore, WD**. Anterior cingulate gyrus volume predicts changes in post-mTBI daytime sleepiness following blue wavelength light therapy. Abstract presented at the Annual Meeting of the International Neuropsychological Society (INS), New York, NY, February 20-23, 2019.
515. Satterfield, BC, LaFollette, K, Lazar, M, & **Killgore, WD**. Prolonged psychosocial stress impairs cognitive flexibility. Abstract presented at the Annual Meeting of the International Neuropsychological Society (INS), New York, NY, February 20-23, 2019.
516. Shepard, KC, Burns, AI, Ozcan, M, Alkozei, A, & **Killgore, WD**. Racial differences regarding the effectiveness of blue light therapy in reducing PTSD severity. Abstract presented at the Annual Meeting of the International Neuropsychological Society (INS), New York, NY, February 20-23, 2019.
517. Shepard, KC, Ozcan, M, Burns, AI, Alkozei, A, Vanuk, JR, & **Killgore, WD**. Differences in anxiety reduction between minority and majority racial groups participating in morning blue light exposure. Abstract presented at the Annual Meeting of the International Neuropsychological Society (INS), New York, NY, February 20-23, 2019.
518. Vanuk, JR., Smith, R, Raikes, AC, Alkozei, A, Skalamera, J, & **Killgore, WD**. Ability based emotional intelligence is associated with greater cardiac vagal tone. Abstract presented at the Annual Meeting of the International Neuropsychological Society (INS), New York, NY, February 20-23, 2019.
519. Vanuk, JR, Shields, S, Slavich, M, & **Killgore, WD**. Lifetime stress exposure during adulthood is associated with lower trait-based emotional intelligence. Abstract presented at the Annual Meeting of the American Psychosomatic Society, Vancouver, BC, March 6-9, 2019.
520. Raikes, AC, Satterfield, BC, Grandner, MA, & **Killgore, WD**. Daily blue light therapy reduces persistent post-mild traumatic brain injury daytime sleepiness and post-concussion. Abstract presented at the Rocky Mountain Athletic Trainer's Association Annual Meeting, Phoenix, AZ, April 12, 2019.
521. Bajaj, S, Dailey, NS, Raikes, AC, Vanuk, JR, Weber, M, Rosso, IM, Rauch, SL, & **Killgore, WD**. Effect of blue light therapy on cortical volume and reaction time following mild TBI. Abstract presented at the Organization for Human Brain Mapping Annual Meeting, June 9-13, 2019.
522. Bajaj, S, Raikes, AC, & **Killgore, WD**. Water anisotropy within the default mode network predicts mod shifts following sleep deprivation. Abstract presented at the Organization for Human Brain Mapping Annual Meeting, June 9-13, 2019.
523. Bajaj, S, Raikes, AC, Razi, A, & **Killgore, WD**. Blue-wavelength light strengthens default mode network following mild TBI: A DCM-DTI study. Abstract presented at the Organization for Human Brain Mapping Annual Meeting, June 9-13, 2019.
524. Bajaj, S, & **Killgore, WD**. Sex differences in limbic and risk-taking propensity in healthy individuals. Abstract presented at the Organization for Human Brain Mapping Annual Meeting,

June 9-13, 2019.

- 525. Raikes, AC, Satterfield, BC, Grandner, MA, & **Killgore, WD**. Daily blue light therapy reduces persistent post-mild traumatic brain injury daytime sleepiness and post-concussion. Abstract presented at the Rocky Mountain Athletic Trainer's Association Annual Meeting, Phoenix, AZ, April 12, 2019.
- 526. Raikes, AC., Athey, A, Alfonso-Miller, P, **Killgore, WD**, & Grandner, MA. Self-reported insomnia and daytime sleepiness increase athletes' sports-related concussion risk. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
- 527. Raikes, AC, Satterfield, BC, Bajaj, S, Grandner, MA, & **Killgore, WD**. Daily blue light therapy reduces daytime sleepiness and post-concussion symptoms after mild traumatic brain injury. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
- 528. Burns, AI, Shepard, KC, Ozcan, M, LaFollette, K, Alkozei, A, Vanuk, JR, Raikes, AC, Grandner, MA, & **Killgore, WD**. Gratitude and frequency of naps predict resilience for individuals with PTSD. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
- 529. Burns, AI, Ozcan, M, Shepard, KC, LaFollette, K, Alkozei, A, Grandner, MA, & **Killgore, WD**. The association between PTSD severity and insomnia is mediated by nightmares. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
- 530. Bajaj, S, Dailey, NS, Raikes, AC, Vanuk, JR, Grandner, MA, Weber, M, Rosso, IM, Rauch, SL, & **Killgore, WD**. Impact of light therapy on brain structure and simple reaction time following mild traumatic brain injury. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
- 531. Bajaj, S, Raikes, AC, Grandner, MA, & **Killgore, WD**. Quantitative anisotropy within the default-mode network predicts mood degradation following sleep-deprivation. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
- 532. Dailey, NS, Satterfield, BC, Raikes, AC, Strong, MJ, Forbeck, B, Grandner, MA, & **Killgore, WD**. Disrupted thalamocortical connectivity following mild traumatic brain injury: Associations with daytime sleepiness. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
- 533. Shepard, KC, Ozcan, M, Burns, AI, Grandner, MA, & **Killgore, WD**. Use of anger words in trauma narratives is negatively associated with sleep quality for single individuals with PTSD. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
- 534. Shepard, KC, Ozcan, M, Burns, AI, Vanuk, JR, Grandner, MA, Alkozei, A, & **Killgore, WD**.

The relationships between psychopathology and sleep problems differ between racial minority groups. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.

- 535. **Killgore, WD**, & Kamimori, GH. Can caffeine sustain attention and vigilance under prolonged monotonous conditions during 77 hours of total sleep deprivation? Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
- 536. **Killgore, WD**, Pace-Schott, Ozcan, M, Shepard, KC, Burns, AI, Grandner, MA, Vanuk, JR, & Alkozei, A. Morning blue light exposure improves sleep and fear extinction recall in PTSD. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
- 537. LaFollette, K, Satterfield, BC, Esbit, S, Lazar, M, Grandner, MA, & **Killgore, WD**. Negative mood and poor sleep are associated with altered moral reasoning under stress. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
- 538. LaFollette, KJ, Satterfield, BC, Esbit, S, Lazar, M, Grandner, MA, & **Killgore, WD**. The effects of prior at-home sleep duration on reversal-learning during a “shoot/no-shoot” task. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
- 539. Ozcan, M, Shepard, KC, Burns, AI, Raikes, AC, Dailey, NS, Alkozei, A, Grandner, MA, & **Killgore, WD**. Individuals with PTSD whose traumatic experiences occurred within the home have worse sleep outcomes. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
- 540. Ozcan, M, Shepard, KC., Burns, AI, Raikes, AC, Dailey, NS, Alkozei, A, Grandner, MA, & **Killgore, WD**. PTSD severity and use of negative emotion words in trauma narratives predict nightmares in individuals with PTSD. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
- 541. Satterfield, BC, Silveri, MM, Grandner, MA, & **Killgore, WD**. Baseline GABA levels predict time-on-task performance during sleep deprivation. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
- 542. Skalamera, J, Huang, YH, Chinkers, M, Richards, MM, & **Killgore, WDS**. The influence of habitual sleep duration on rational thinking ability. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
- 543. Bliznak, V, Perlis, ML, Ellis, J, Hale, L, **Killgore, WD**, Warlick, C, Alfonso-Miller, P, & Grandner, MA. What is the ideal bedtime? Data from a community sample. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.

544. Lane, E, Ellis, J, **Killgore, WD**, Warlick, C, Alfonso-Miller, P, & Grandner, MA. Sociodemographic, socioeconomic, and behavioral correlates of nightmare frequency in a community sample. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
545. Jajoo, A, Taylor-Pilliaie, R, **Killgore, WD**, Warlick, C, Alfonso-Miller, P, & Grandner, MA. Types of habitual physical activity associated with habitual sleep duration, sleep quality, and daytime sleepiness. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
546. Khader, W, Fernandez, F, Seizas, A, Knowlden, A, Ellis, J, Williams, N, Hale, L, Perlis, M, Jean-Louis, G, **Killgore, WD**, Alfonso-Miller, P, & Grandner, MA. What makes people want to make changes to their sleep? Assessment of perceived risks of insufficient sleep as a predictor of intent to improve sleep. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
547. Pham, B, Hale, L, St-Onge, M, **Killgore, WD**, Warlick, C, Alfonso-Miller, P, & Grandner, MA. Habitual dietary quality associated with habitual sleep duration, insomnia, daytime sleepiness, and fatigue in a community sample. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
548. Begay, T, Gooneratne, N, Williams, N, Seixas, A, Jean-Louis, G, Gilles, A, **Killgore, WD**, Alfonso-Miller, P, & Grandner, MA. Sleep disparities in the United States and the impact of poverty. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
549. Griffen, N, Hale, L, Jean-Louis, G, **Killgore, WD**, Warlick, C, Alfonso-Miller, & Grandner, MA. Aspects of disordered neighborhoods are associated with insomnia, sleepiness, fatigue and control over sleep. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
550. Liang, O, Seixas, A, Parthasarathy, S, Jean-Louis, G, **Killgore, WD**, Warlick, C, Alfonso-Miller, P, & Grandner, MA. Healthcare financial hardship and habitual sleep duration, impact on sleep disparities, and impact on the sleep-obesity relationship. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
551. Olivier, K, Perlis, ML, Troxel, W, Basner, M, Chakravorty, S, Tubbs, A, Owens, J, Jean-Louis, G, **Killgore, WD**, Warlick, C, Alfonso-Miller, P, & Grandner, MA. Influence of likely nocturnal wakefulness on 24-hour patterns of violent crime in adults and juveniles. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
552. Featherston, B, Perlis, ML, Ellis, J, Williams, N, Jean-Louis, G, **Killgore, WD**, Warlick, C, Alfonso-Miller, P, & Grandner, MA. The concept of “satisfaction with sleep: Associations with sleep continuity, sleep quality, daytime sleepiness, and related concepts of overall health, stress, depression, and anxiety. Abstract presented at the 2019 Annual Meeting of the Associated

Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.

553. Fourte, DA, Patterson, F, Malhotra, A, Seixas, A, **Killgore, WD**, Alfonso-Miller, P, & Grandner, MA. Should habitual sleep duration be added to the American Heart Association's "Life's Simple 7?" Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
554. Wills, C, Athey, A, Robbins, R, Patterson, F, Turner, R, **Killgore, WD**, Tubbs, A, Warlick, C, Alfonso-Miller, P, & Grandner, MA. Chronotype and social support among student athletes: Impact on depressive symptoms. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
555. Ramsey, T, Athey, A, Ellis, J, Tubbs, A, Turner, R, **Killgore, WD**, Warlick, C, Alfonso-Miller, P, & Grandner, MA. Dose-response relationships between insufficient sleep and mental health symptoms in collegiate student athletes and non-athletes. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
556. Quiroz, H, Chakravorty, S, **Killgore, WD**, Warlick, C, Alfonso-Miller, P, & Grandner, MA. Sleep-related determinants of habitual cannabis use, desire to use, and problematic use: Data from a community sample. Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
557. Warlick, C, Williams, N, Hale, L, **Killgore, WD**, Alfonso-Miller, P, & Grandner, MA. Is relationship satisfaction associated with habitual sleep? Abstract presented at the 2019 Annual Meeting of the Associated Professional Sleep Societies (SLEEP) Conference, San Antonio TX, June 8-12, 2019.
558. Ozcan, M, Burns, AI, Shepard, KC, & **Killgore, WD**. The relationship between combat and non-combat trauma and risk-taking propensity in individuals with PTSD. Abstract presented at the 2019 Military Health System Research Symposium, Kissimmee, FL, August 19-22, 2019.
559. Esbit, S, Satterfield, BC, & **Killgore, WD**. Exploration of emotional intelligence and self-perceived invincibility. Abstract presented at the 2019 Military Health System Research Symposium, Kissimmee, FL, August 19-22, 2019.
560. LaFollette, KJ, Satterfield, BC, & **Killgore, WD**. Self-perceived invincibility is associated with greater cognitive flexibility. Abstract presented at the 2019 Military Health System Research Symposium, Kissimmee, FL, August 19-22, 2019.
561. Strong, M, Esbit, S, LaFollette, KJ, Dailey, NS, & **Killgore, WD**. Big Five personality traits and how they relate to self-perceived invincibility. Abstract presented at the 2019 Military Health System Research Symposium, Kissimmee, FL, August 19-22, 2019.
562. Shepard, KC, Ozcan, M, Burn, AI, Alkozei, A, & **Killgore, WD**. Blue light therapy differences in sleep quality improvement in military and civilian populations. Abstract presented at the 2019 Military Health System Research Symposium, Kissimmee, FL, August 19-22, 2019.

- 563. Raikes, AC, Athey, A, Alfonso-Miller, P, **Killgore, WD**, & Grandner, MA. Moderate-to-severe self-reported insomnia and frequent daytime sleepiness increase athletes' risk for sustaining a sports-related concussion. Abstract presented at the 2019 Military Health System Research Symposium, Kissimmee, FL, August 19-22, 2019.
- 564. Bajaj, S, Dailey, NS, Raikes, AC, Vanuk, JR, Weber, M, Rosso, IM, Rauch, SL, & **Killgore, WD**. Impact of blue-wavelength light therapy on cortical volume and simple reaction time following mild TBI. Abstract presented at the 2019 Military Health System Research Symposium, Kissimmee, FL, August 19-22, 2019.
- 565. Raikes, AC, Satterfield, BC, Bajaj, S, Grandner, MA, & **Killgore, WD**. Daily administered blue light therapy reduces daytime sleepiness and improves somatic symptoms following mild traumatic brain injury. Abstract presented at the 2019 Military Health System Research Symposium, Kissimmee, FL, August 19-22, 2019.
- 566. Burns, AI, Ozcan, M, Shepard, KC, Alkozei, A, Vanuk, JR, & **Killgore, WD**. The relationship between sleep onset latency and gratitude. Abstract presented at the 2019 Military Health System Research Symposium, Kissimmee, FL, August 19-22, 2019.
- 567. LaFollette, KJ, Satterfield, BC, Esbit, S, Lazar, M, & **Killgore, WD**. Inadequate sleep quality and duration predicts disinhibited shooting on a "shoot/no shoot" task. Abstract presented at the 2019 Military Health System Research Symposium, Kissimmee, FL, August 19-22, 2019.
- 568. Bajaj, S, & **Killgore, WD**. Sex differences in risk-taking behavior and brain morphometry in healthy individuals. Abstract presented at the 2019 Military Health System Research Symposium, Kissimmee, FL, August 19-22, 2019.
- 569. Satterfield, BC, Silveri, MM, & **Killgore, WD**. Baseline GABA levels are associated with time-on-task performance during sleep deprivation. Abstract presented at the 2019 Military Health System Research Symposium, Kissimmee, FL, August 19-22, 2019.
- 570. **Killgore, WD**, Ozcan, M, Shepard, KC, Burns, AI, Vanuk, JR, & Alkozei, A. Blue light exposure enhances sleep and fear extinction recall in PTSD. Abstract presented at the 2019 Military Health System Research Symposium, Kissimmee, FL, August 19-22, 2019.
- 571. LaFollette, K, Satterfield, BC, Lazar, M., **Killgore, WDS**. Disentangling the Effects of Subjective Task Load and Performance on Neuroendocrine Stress Response. Poster presented at the 49th Annual Society for Neuroscience Meeting, Chicago, IL, October, 2019.
- 572. Dailey, NS, & **Killgore, WD**. Disrupted thalamocortical connectivity following mild traumatic brain injury: Associations with daytime sleepiness. Oral presentation at the American Speech-Language Hearing Association Conference, Orlando, FL, November, 2019.
- 573. Dailey, NS, & **Killgore, WD**. Reading fluency in mild traumatic brain injury. Poster presented at the American Speech-Language Hearing Association Conference, Orlando, FL, November, 2019.
- 574. Raikes, AC, Alkozei, A, Vanuk, JR, Bajaj, S, Satterfield, BC, & **Killgore, WD**. Blue light

therapy reduces daytime sleepiness as well as depressive and somatic post-concussive symptoms following mild traumatic brain injury. Abstract accepted for Oral presentation at the 48th Annual Meeting of the International Neuropsychological Society, Denver CO, February 5-8, 2020.
[*Winner of Nelson Butters Research Award for Best Paper by a Post-Doctoral Fellow].

- 575. Raikes, AC, Bajaj, S, Dailey, NS, Vanuk, JR, Alkozei, A, & **Killgore, WD**. Vestibular and emotional symptoms are associated with altered large-scale network resting state functional connectivity after mild traumatic brain injury. Abstract accepted for Poster presentation at the 48th Annual Meeting of the International Neuropsychological Society, Denver CO, February 5-8, 2020.
- 576. Esbit, S, Satterfield, BC, LaFollette, K, Lazar, M, & **Killgore, WD**. Gender differences and overriding misleading impulses. Abstract accepted for Poster presentation at the 48th Annual Meeting of the International Neuropsychological Society, Denver CO, February 5-8, 2020.
- 577. Esbit, S, Raygoza, D, Meinhausen, C, Dailey, NS, & **Killgore, WD**. Exploring verbal recall throughout mild traumatic brain injury recovery. Abstract accepted for Poster presentation at the 48th Annual Meeting of the International Neuropsychological Society, Denver CO, February 5-8, 2020.
- 578. Meinhausen, C, Esbit, S, Dailey, NS, & **Killgore, WD**. Self-initiated verbal recall strategies following mild traumatic brain injury. Abstract accepted for Poster presentation at the 48th Annual Meeting of the International Neuropsychological Society, Denver CO, February 5-8, 2020.
- 579. Anlap, I, Esbit, S, Alkozei, A, Satterfield, BC, & **Killgore, WD**. The effects of gratitude on wellbeing are mediated by social support. Abstract accepted for Poster presentation at the 48th Annual Meeting of the International Neuropsychological Society, Denver CO, February 5-8, 2020.
- 580. Dailey, NS, Raikes, AC, Bajaj, S, Alkozei, A, Sanasac, S, & **Killgore, WD**. Frontal cortical surface area is associated with lexical-semantic knowledge in adults with mild traumatic brain injury. Abstract accepted for Poster presentation at the 48th Annual Meeting of the International Neuropsychological Society, Denver CO, February 5-8, 2020.
- 581. **Killgore, WD**, Burns, AI, Shepard, KC, Vanuk, JR, & Alkozei, A. Enhancing fear extinction recall in PTSD using blue light therapy. Abstract accepted for Poster presentation at the 48th Annual Meeting of the International Neuropsychological Society, Denver CO, February 5-8, 2020.
- 582. **Killgore, WD**, & Kamimori, GH. The effects of caffeine under monotonous conditions during prolonged total sleep deprivation. Abstract accepted for Poster presentation at the 48th Annual Meeting of the International Neuropsychological Society, Denver CO, February 5-8, 2020.
- 583. **Killgore, WD**, & Kamimori, GH. Trait extraversion is associated with increased suicidal ideation during sleep deprivation. Abstract accepted for Poster presentation at the 48th Annual Meeting of the International Neuropsychological Society, Denver CO, February 5-8, 2020.

584. Bullock, A, Burns, AI, Shepard, KC, Alkozei, A, & **Killgore, WD**. Alterations in cognitive symptoms of PTSD are correlated with somatic symptoms. Abstract accepted for Poster presentation at the 48th Annual Meeting of the International Neuropsychological Society, Denver CO, February 5-8, 2020.
585. Taylor, E, & **Killgore, WD**. Caffeine and emotional control. Abstract accepted for Poster presentation at the 48th Annual Meeting of the International Neuropsychological Society, Denver CO, February 5-8, 2020.
586. Taylor, E, & **Killgore, WD**. Emotionally intelligent early birds. Abstract accepted for Poster presentation at the 48th Annual Meeting of the International Neuropsychological Society, Denver CO, February 5-8, 2020.
587. Alkozei, A, Dailey, NS, Bajaj, S, Vanuk, JR, Raikes, AC, & **Killgore, WD**. The effects of blue wavelength light on subsequent amygdala-DLPFC connectivity at rest. Abstract accepted for Poster presentation at the 48th Annual Meeting of the International Neuropsychological Society, Denver CO, February 5-8, 2020.
588. Vanuk, JR, Raikes, AC, Alkozei, A, Shields, GS, Slavich, GM, & **Killgore, WD**. Lifetime stress exposure during adulthood is associated with lower emotional intelligence. Abstract accepted for Poster presentation at the 48th Annual Meeting of the International Neuropsychological Society, Denver CO, February 5-8, 2020.
589. LaFollette, K, Satterfield, BC, Lazar, M., **Killgore, WD**. The propensity for model-based control is associated with individual differences in risk behavior. Abstract submitted for presentation at the Computational and Systems Neuroscience (Cosyne) 2020 Meeting, Denver, CO, February, 2020.
590. Vanuk, JR, Alkozei, A, Burns, AI, Bullock, AD, & **Killgore, WD**. Sleep and fear extinction recall in PTSD improves with morning blue light exposure therapy. Abstract accepted for oral presentation at the 78th Annual Scientific Meeting of the American Psychosomatic Society, Long Beach, CA, March 11-14, 2020.
591. **Killgore, WD**, Burns, AI, Bullock, A, Vanuk, J, Taylor, E, Alkozei, A. Using blue light to consolidate fear extinction memory in PTSD. Abstract accepted for Poster presentation at the 40th Annual Conference of the Anxiety and Depression Association of America, San Antonio, TX, March 19-22, 2020.
592. **Killgore, WD**, & Kamimori, GH. Can caffeine sustain cognitive resilience during 77 hours of stressful total sleep deprivation? Abstract accepted for Poster presentation at the 40th Annual Conference of the Anxiety and Depression Association of America, San Antonio, TX, March 19-22, 2020.
593. **Killgore, WD**, Skalamera, J, Vanuk, J, Woods-Lubert, R, Cloonan, S, Alkozei, A, Dailey, N, Lane, R, Weihs, K, Allen, J, and Smith, R. Preliminary validation of a web-based emotional intelligence training program for enhancing emotional resilience. Abstract accepted for Poster

presentation at the 40th Annual Conference of the Anxiety and Depression Association of America, San Antonio, TX, March 19-22, 2020.

- 594. **Killgore, WD,** & Kamimori, GH. Extraverts show increased suicidal ideation during sleep deprivation. Abstract accepted for Poster presentation at the 40th Annual Conference of the Anxiety and Depression Association of America, San Antonio, TX, March 19-22, 2020.
- 595. **Killgore, WD,** Cloonan, S, Woods-Lubert, R, Taylor, E, & Skalamera, J. Political perspective is associated with differences in trait anxiety and depression. Abstract accepted for Poster presentation at the 40th Annual Conference of the Anxiety and Depression Association of America, San Antonio, TX, March 19-22, 2020.
- 596. Alkozei, A, Dailey, NS, Bajaj, S, Vanuk, JR, Raikes, AC, & **Killgore, WD.** Acute blue wavelength light exposure influences functional brain connectivity. Abstract accepted for Poster presentation at the 40th Annual Conference of the Anxiety and Depression Association of America, San Antonio, TX, March 19-22, 2020.
- 597. Burns, A, Shepard, KC, Bullock, A, Esbit, S, Alkozei, A, Satterfield, B, & **Killgore, WD.** The association between life history strategy and anxiety is mediated by trait gratitude. Abstract accepted for Poster presentation at the 40th Annual Conference of the Anxiety and Depression Association of America, San Antonio, TX, March 19-22, 2020.
- 598. Bullock, A, Shepard, KC, Burns, A, Raikes, A, Alkozei, A, & **Killgore, WD.** Use of family words in trauma narratives predicts a higher risk of insomnia in individuals with PTSD. Abstract accepted for Poster presentation at the 40th Annual Conference of the Anxiety and Depression Association of America, San Antonio, TX, March 19-22, 2020.
- 599. **Killgore, WD.** Blue light therapy enhances sleep and fear extinction recall in PTSD. Symposium abstract accepted for presentation at the 75th Annual Meeting of the Society of Biological Psychiatry, New York, NY, April 30-May 2, 2020.
- 600. **Killgore, WD,** & Kamimori, GH. Extraversion and caffeine intake relate to suicidal ideation during sleep deprivation. Abstract accepted for Poster presentation at the 75th Annual Meeting of the Society of Biological Psychiatry, New York, NY, April 30-May 2, 2020.
- 601. **Killgore, WD,** Burns, AI, Bullock, A, Vanuk, JR, Taylor, E, & Alkozei, A. Morning blue light improves consolidation of fear extinction memory in PTSD. Abstract accepted for Poster presentation at the 75th Annual Meeting of the Society of Biological Psychiatry, New York, NY, April 30-May 2, 2020.
- 602. **Killgore, WD,** & Kamimori, GH. Effects of repeated dosing of caffeine on cognitive performance during prolonged sleep deprivation. Abstract accepted for Poster presentation at the 75th Annual Meeting of the Society of Biological Psychiatry, New York, NY, April 30-May 2, 2020.

603. Alkozei, A, Dailey, NS, Bajaj, S, Vanuk, JR, Raikes, AC, & **Killgore, WD**. Blue wavelength light and its effects on functional brain connectivity. Abstract accepted for Poster presentation at the 75th Annual Meeting of the Society of Biological Psychiatry, New York, NY, April 30-May 2, 2020.
604. Lucas, DA, Dailey, NS, & **Killgore, WD**. Implications for targeted interventions following mild traumatic brain injury: Post-concussion symptom severity predicts cognitive flexibility. Abstract accepted for Poster presentation at the 75th Annual Meeting of the Society of Biological Psychiatry, New York, NY, April 30-May 2, 2020.
605. Jecmen, D, King, R, Gould, J, Mitchell, J, Ralston, K, Alkozei, A, & **Killgore, WD**. The effect of blue light therapy on functional brain responses to masked fearful stimuli in post-traumatic stress disorder. Abstract accepted for Poster presentation at the 75th Annual Meeting of the Society of Biological Psychiatry, New York, NY, April 30-May 2, 2020.
606. King, R, Jecmen, D, Mitchell, J, Ralston, K, Gould, J, Burns, A, Bullock, A, Alkozei, A, & **Killgore, WD**. Co-morbid depressive symptoms are associated with reduced functional brain responses within the insula and visual cortex in response to masked happy faces in individuals with PTSD. Abstract accepted for Poster presentation at the 75th Annual Meeting of the Society of Biological Psychiatry, New York, NY, April 30-May 2, 2020.
607. Dailey, NS, Raikes, AC, Alkozei, A, Grandner, MA, & **Killgore WD**. Reduced cortical thickness as a biomarker of daytime sleepiness in mild traumatic brain injury. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
608. Dailey, NS, Raikes, AC, Wager, ME, Grandner, MA, Alkozei, WD. The compounding impact of daytime sleepiness and brain injury on sustained vigilance. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
609. Anlap, I, Taylor, E, Grandner, MA, & **Killgore, WD**. Gray matter volume of the rostral medial prefrontal cortex is associated with resilience to mood decline during overnight sleep deprivation. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
610. Raikes, AC, Dailey, NS, Alkozei, A, Vanuk, JR, Grandner, MA, & **Killgore, WD**. Daytime sleepiness, depression, and post-concussive symptoms improve following prescribed morning exposure to blue light. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
611. Raikes, AD, Dailey, NS, Vanuk, JR, Alkozei, A, Grandner, MA, **Killgore, WD**. Improved daytime sleepiness following daily morning blue light therapy is associated with altered resting-state network connectivity. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.

612. Satterfield, BC, Anlap, I, Esbit, S, & **Killgore, WD**. Corticotropin-releasing hormone receptor 1 gene polymorphism modulates cognitive flexibility following acute stress and total sleep deprivation. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
613. Jecmen, D, King, R, Gould, J, Mitchell, J, Ralston, K, Burns, AI, Bullock, A, Grandner, MA, Alkozei, A, & **Killgore, WD**. The effects of morning blue light therapy on insomnia severity and PTSD symptoms in a clinical sample. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
614. Taylor, E, Grandner, MA, & **Killgore, WD**. Later bedtime is associated with differences in prefrontal gray matter volume and executive function deficit. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
615. Taylor, E, & **Killgore, WD**. Meta-analysis on the effects of caffeine on neurodegenerative cognitive decline. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
616. LaFollette, KJ, Satterfield, BC, Esbit, S, Lazar, M, Grandner, MA, & **Killgore, WD**. Emotion regulation during sleep deprivation and repeated physiological stress: Implications for motor skill learning and production. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
617. King, R, Jecmen, D, Mitchell, J, Ralston, K, Gould, J, Burns, AI, Bullock, A, Grandner, MA, Alkozei, A, & **Killgore, WD**. Habitual sleep duration is negatively correlated with emotional reactivity within the rostral anterior cingulate cortex in individuals with PTSD. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
618. King, R, Jecmen, D, Alkozei, A, Raikes, A, Grandner, MA, & **Killgore, WD**. Hippocampal gray matter volume in healthy adult population is associated with habitual sleep duration. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
619. Burns, AI, Bullock, A, Taylor, E, Grandner, MA, Alkozei, A, & **Killgore, WD**. The association between sleep problems and risk-taking behavior differs between racial majority and minority groups. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
620. Burns, AI, Bullock, A, Raikes, AC, Dailey, NS, Grandner, MA, & **Killgore, WD**. Daytime sleepiness correlates with increased gray matter volume in the right middle temporal gyrus in healthy young individuals. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.

621. **Killgore, WD**, Dailey, NS, Raikes, AC, Vanuk, John R, Taylor, E, Grandner, MA, & Alkozei, A. Blue light exposure enhances neural efficiency of the task positive network during a cognitive interference task. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
622. **Killgore, WD**, Dailey, NS, Raikes, AC, Vanuk, JR, Taylor, E, Grandner, MA, & Alkozei, A. Resilience to inhibitory deficits during sleep deprivation is predicted by gray matter volume in the ventromedial and ventrolateral prefrontal cortex. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
623. Bullock, A, Burns, A, Taylor, E, Grandner, MA, Miller, MM, Alkozei, A, & **Killgore, WD**. Self-referential language in trauma narratives predicts shorter sleep duration in women with PTSD. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
624. Vanuk, JR, Raikes, AC, Dailey, NS, Grandner, MA, & **Killgore, WD**. Grey matter volumetric differences are predictive of attentional lapses during sleep deprivation. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
625. Meinhausen, CE, Vanuk, JR, Grandner, MA, & **Killgore, WD**. Gray matter volume correlates of psychomotor vigilance speed during sleep deprivation. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
626. Kapoor, A, Perlis, M, Bastien, C, Williams, N, Hale, L, Branas, C, Barrett, M, **Killgore, WD**, Wills, CC, & Grandner, MA. Disassembling Associations between Insomnia and Anxiety Symptoms: Which Elements of Insomnia are Associated with Which Elements of Anxiety? Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
627. Ramsey, T, Athey, A, Auerbach, A, Turner, R, Williams, N, Jean-Louis, G, **Killgore, WD**, Wills, CC, & Grandner, MA. Sleep Duration and Symptoms Associated with Race/Ethnicity in Elite Collegiate Athletes. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
628. Piro, B, Garland, S, Jean-Pierre, P, Gonzalez, B, Seixas, A, **Killgore, WD**, Wills, CC, & Grandner, MA. Sleep Duration and Sleep Timing Associated with History of Breast, Prostate, and Skin Cancer: Data from a Nationally-Representative Sample. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
629. Bombarda, A, St-Onge, M, Seixas, A, Williams, N, Jean-Louis, G, **Killgore, WD**, Wills, CC, & Grandner, MA. Sleep Duration and Timing Associated with Eating Behaviors: Data from NHANES 2015-2016. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.

630. Abdi, H, Athey, A, Auerbach, A, Turner, R, **Killgore, WD**, Wills, CC, & Grandner, MA. College Football Players Compared to Other Collegiate Athletes: Symptoms of Insufficient Sleep Duration, Insomnia, and Sleep Apnea. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
631. Holbert, C, Bastien, C, Chakravorty, S, **Killgore, WD**, Wills, CC, & Grandner, MA. Hallucinogen Use Among College and University Students: Associations with Insufficient Sleep and Insomnia. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
632. Onyeonwu, C, Nowakowski, S, Hale, L, Branas, C, Barrett, M, **Killgore, WD**, Wills, CC, & Grandner, MA. Menstrual Regularity and Bleeding Associated with Sleep Duration, Sleep Quality, and Daytime Sleepiness in a Community Sample. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
633. Ghani, S, Delgadillo, ME, **Killgore, WD**, Wills, CC, & Grandner, MA. Culturally Consistent Diet Among Individuals of Mexican Descent at the US-Mexico Border Is Associated with Sleep Duration and Quality. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
634. Mason, B, Tubbs, A, Hale, L, Branas, C, Barrett, M, **Killgore, WD**, Wills, CC, & Grandner, MA. Use of Mobile Devices at Night Associated with Mental Health in Young Adults. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
635. Gozar, A, Seixas, A, Hale, L, Branas, C, Barrett, M, **Killgore, WD**, Wills, CC, Grandner, MA. Mobile Device Use in Bed and Relationships to Work Productivity: Impact of Anxiety. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
636. Barker, M, St-Onge, M, Seixas, A, **Killgore, WD**, Wills, CC, & Grandner, MA. Dietary Macronutrients and Sleep Duration, Sleep Disturbance, and Daytime Fatigue. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
637. Phan, S, Perlis, ML, Hale, L, Branas, C, **Killgore, WD**, Wills, CC, & Grandner, MA. Reconsidering Stimulus Control: Activities in Bed Differentially Associated with Sleep-Related Outcomes. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
638. Grandner, MA, Tubbs, A, Jean-Louis, G, Seixas, A, Hale, L, Branas, C, **Killgore, WD**, & Wills, CC. Daytime Sleepiness in the Community: Implications for Sleep Health, Circadian Health, and Overall Physical Health. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.

639. Begay, T, Tubbs, A, Jean-Louis, G, Hale, L, Branas, C, **Killgore, WD**, Wills, CC, & Grandner, MA. Demographic and Socioeconomic Implications of Excessive Daytime Sleepiness in the Community. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
640. Khader, WS, Tubbs, A, Fernandez, F, Chakravorty, S, Hale, L, Branas, C, Barrett, M, **Killgore, WD**, Wills, CC, & Grandner, MA. Community-Level Daytime Sleepiness and Substance Use: Implications of Sleep Time and Mental Health. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
641. Jajoo, A, Tubbs, A, Perlis, ML, Chakravorty, S, Seixas, A, **Killgore, WD**, Wills, CC, & Grandner, MA. Population-Level Suicide Ideation: Impact of Combined Roles of Sleep Duration, Sleep Disturbance, and Daytime Sleepiness. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
642. Clay, MA, Athey, A, Charest, J, Auerbach, A, Turner, R, **Killgore, WD**, Wills, CC, & Grandner, MA. Team-Based Athletes Sleep Less than Individual Athletes, But Do Not Report More Insomnia or Fatigue. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
643. Grandner, MA, Fernandez, F, Khader, S, Jean-Louis, G, Seixas, A, Williams, N, **Killgore, WD**, & Wills, CC. Decline in Habitual Sleep Duration over 10 Years and Worsening Sleep Disparities: Data From NHIS 2006-2015. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
644. Villalobos, KM, Seixas, A, Williams, N, Jean-Louis, G, **Killgore, WD**, Wills, CC, & Grandner, MA. Disparities in Sleep Timing in the US: Data from the National Health and Nutrition Examination Survey 2015-2016. Abstract submitted for Poster presentation at the 34th Annual SLEEP Conference, Philadelphia, PA, June 13-17, 2020.
645. Valencia, LR, Bullock, A, Miller, M, Johnson, J, **Killgore, WD**. Incorporation of cardio exercise is associated to increased levels of gratitude among PTSD patients. Abstract submitted for presentation at the Annual Meeting of the International Neuropsychological Society (INS), San Diego, CA, February 3-6, 2021.
646. Cloonan, S, Persich, M, Woods-Lubbert, RA, Smith, R, Skalamera, J, & **Killgore, WD**. Examining changes to perceived and ability emotional intelligence following emotional intelligence-specific training. Abstract submitted for presentation at the Annual Meeting of the International Neuropsychological Society (INS), San Diego, CA, February 3-6, 2021.
647. Johnson, J., Anlap, I, Taylor, EC, Valencia, LR, Bullock, A, Swift, N, Wellman, C, Vanuk, J, & **Killgore, WD**. The association between anxiety and intelligence is moderated by sex. Abstract submitted for presentation at the Annual Meeting of the International Neuropsychological Society

(INS), San Diego, CA, February 3-6, 2021.

- 648. Persich, M, Cloonan, S, Woods-Lubbert, RA, Smith, R, Skalamera, J, & **Killgore, WD**. Emotional intelligence training and improvements to emotional regulation. Abstract submitted for presentation at the Annual Meeting of the International Neuropsychological Society (INS), San Diego, CA, February 3-6, 2021.
- 649. Vanuk, J, Bullock, A, Forbeck, B, Dailey, NS, & **Killgore, WD**. Severity of PTSD symptoms is associated with greater levels of depression and deficits in short-term memory. Abstract submitted for presentation at the Annual Meeting of the International Neuropsychological Society (INS), San Diego, CA, February 3-6, 2021.
- 650. **Killgore, WD**, Cloonan, S, Woods-Lubbert, RA, Vanuk, J, Persich, M, Dailey, NS, Strong, MJ, King, RJ, Lane, RD, & Smith, R. Enhancing emotional awareness with an online training program. Abstract submitted for presentation at the Annual Meeting of the International Neuropsychological Society (INS), San Diego, CA, February 3-6, 2021.
- 651. **Killgore, WD**, Cloonan, S, Woods-Lubbert, RA, Vanuk, J, Persich, M, Dailey, NS, Strong, MJ, King, RJ, Lane, RD, and Smith, R. Training interoceptive awareness. Abstract submitted for presentation at the Annual Meeting of the International Neuropsychological Society (INS), San Diego, CA, February 3-6, 2021.
- 652. **Killgore, WD**, Vanuk, J, Woods-Lubbert, RA, Cloonan, S, Persich, M, Dailey, NS, King, RJ, Strong, MJ, Lane, RD, and Smith, R. Can emotional resilience be trained? Abstract submitted for presentation at the Annual Meeting of the International Neuropsychological Society (INS), San Diego, CA, February 3-6, 2021.
- 653. **Killgore, WD**, Skalamera, J, Ozcan, M, Cloonan, S, Woods-Lubbert, RA, Persich, M, & Smith, R. Development and validation of the Interpersonal Affect Regulation Test (IPART). Abstract submitted for presentation at the Annual Meeting of the International Neuropsychological Society (INS), San Diego, CA, February 3-6, 2021.
- 654. Dailey, NS, Raikes, AC, Alkozei, A, Vanuk, J, & **Killgore, WD**. A shared biomarker of cognitive ability and sleep disruptions in mild traumatic brain injury. Abstract submitted for presentation at the Annual Meeting of the International Neuropsychological Society (INS), San Diego, CA, February 3-6, 2021.
- 655. Mason, BJ, Tubbs, AS, **Killgore, WD**, Fernandex, FX, & Grandner, MA. How much do blue-blockers block do block blue? Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
- 656. Bobadilla, V, Mason, BJ, Tubbs, AS, Fernandez, FX, **Killgore, WD**, & Grandner, MA. Blue blockers' ability to filter circadian-active light emitted from a tablet. Abstract submitted for

presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.

657. Ruppel, D, Mason, BJ, Tubbs, AS, Fernandex FX, **Killgore, WD**, & Grandner, MA. Spectrophotometric properties of 31 different commercially available blue blocking glasses under room lighting. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
658. Mason, BJ, Tubbs, AS, Fernandex, FX, **Killgore, WD**, & Grandner, MA. Spectrophotometric properties of commercial blue-blocking lenses in sunlight. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
659. Abdi, H, Kennedy, KE, **Killgore, WD**, Wills, CC, Charest, J, & Grandner, MA. Changes in physical activity during the COVID-19 pandemic associated with changes in sleep. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
660. Jajoo, A, Kennedy, KE, Lujan, M, **Killgore, WD**, Wills, CC, & Grandner, MA. Chanigni sleep during the COVID pandemic associated with daytime cognitive function. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
661. Ghani, SB, Kennedy, KE, Seixas, A, **Killgore, WD**, Wills, CC, & Grandner, MA. Changes in sleep due to COVID pandemic associated with changes to dietary patterns. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
662. Wills, CC, Kennedy, KE, Bastien, C, Ruby, P, **Killgore, WD**, & Grandner, MA. Changes in dream recall during the COVID-19 pandemic: Associations with sleep, stress and dream content. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
663. Holbert, C, Kennedy, KE, **Killgore, WD**, Wills, CC, & Grandner, MA. Changes in sleep due to the COVID pandemic associated with sleep environment. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
664. Lujan, M, Kennedy, KE, **Killgore, WD**, Wills, CC, & Grandner, MA. Sleep disturbance during the COVID-19 pandemic associated with worries and fears about possible infection. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
665. Kennedy, KE, Bastien, C, Ruby, P, **Killgore, WD**, Wills, CC, & Grandner, MA. Nightmare content during the COVID-19 pandemic: Influence of COVID-related stress and sleep disruption. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
666. VAnencia, D, Ghani, S, Delgadillo, ME, Madhivan, P, Krupp, K, Ruiz, J, Seixas, A, **Killgore, WD**, Wills, CC, & Grandner, MA. COVID-19 pandemic sleep disturbances related to dietary behavior at the US-Mexico border. Abstract submitted for presentation at the 35th Annual SLEEP

Conference, Virtual, June 10-13, 2021.

667. Isalva, L, Vanencia, D, Ghani, S, Delgadillo, ME, Bastien, C, Madhivan, P, Krupp, K, Ruiz, J, **Killgore, WD**, Wills, CC, & Grandner, MA. COVID-19 pandemic sleep and dreams at the US-Mexico border. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
668. Arce, R, Valencia, D, Ghani, S, Delgadillo, ME, Madhivan, P, Krupp, K, Ruiz, J, Seixas, A, **Killgore, WD**, Wills, CC, & Grandner, MA. COVID-19 pandemic sleep changes related to social and financial impacts at the US-Mexico border. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
669. Begay, T, Valencia, D, Ghani, S, Delgadillo, ME, Bastien, C, Madhivan, P, Krupp, K, Ruiz, J, **Killgore, WD**, Wills, CC, & Grandner, MA. COVID-19 pandemic nightmares at the US-Mexico border. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
670. Begay, T, Valencia, D, Ghani, S, Delgadillo, ME, Madhivan, P, Krupp, K, Ruiz, J, Seixas, A, **Killgore, WD**, Wills, CC, & Grandner, MA. COVID-19 pandemic sleep disturbances related to stress experiences at the US-Mexico border. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
671. Grandner, MA, Ruby, P, **Killgore, WD**, Kennedy, KE, Wills, CC. An election during a pandemic: Relationship between political affiliation and pandemic-related sleep and dreams. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
672. Kennedy, KE, Seixas, A, **Killgore, WD**, Wills, CC, & Grandner, MA. Changes in sleep due to the COVID-19 pandemic associated with COVID-related general, financial, food, housing, family and relationship stress. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
673. Barker, M, Gilles, A, Ghani, S, **Killgore, WD**, Wills, CC, & Grandner, MA. Sociodemographic, behavioral, and health-related factors associated with sleep duration and quality among a nationally-representative sample of native Hawaiians and other Pacific Islanders. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
674. Craig, C, Kennedy, KE, Perlis, ML, Seixas, A, **Killgore, WD**, Wills, CC, & Grandner, MA. Relationships between habitual sleep duration and chronic pain conditions in the US population over a 10-year period: Implications for sleep health disparities. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
675. Hanley, B, Gorovoy, S, Chamberlain, S, Bushan, B, Ghani, S, **Killgore, WD**, Wills, CC, & Grandner, MA. Parent and child sleep quality and nighttime activities. Abstract submitted for

presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.

- 676. **Killgore, WD**, Cloonan, SA, Taylor, EC, Grandner, MA, & Dailey, NS. Insomnia as a risk for PTSD during the COVID-19 pandemic. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
- 677. **Killgore, WD**, Capaldi, VF, Grandner, MA, & Kamimori, GH. Trait extraversion is associated with increased suicidal ideation during total sleep deprivation and insomnia. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
- 678. Cloonan, SA, Grandner, MA, & **Killgore, WD**. Loneliness and lockdowns: The effects of the COVID-19 pandemic on insomnia symptoms. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
- 679. Janowski, S, Cloonan, SA, Grandner, MA, & **Killgore, WD**. Sleeping well during a pandemic: The role of various forms of social support in protecting against insomnia. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
- 680. Le, AJ, Dailey, NS, Grandner, MA, & **Killgore, WD**. Obstructive sleep apnea symptoms predict cognitive function following mild traumatic brain injury. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
- 681. Persich, M, Cloonan, SA, Grandner, MA, & **Killgore, WD**. Self-reported sleep and resilience. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
- 682. Persich, M, Cloonan, SA, Grandner, MA, & **Killgore, WD**. Sleep quality and duration are associated with greater trait emotional intelligence. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
- 683. Taylor, EC, Cloonan, SA, Grandner, MA, & **Killgore, WD**. Insomnia in those diagnosed with COVID-19. Abstract submitted for presentation at the 35th Annual SLEEP Conference, Virtual, June 10-13, 2021.
- 684. Cloonan, SA, Persich, MR, & **Killgore, WD**. Resilience mediates the effect of actual and perceived emotional intelligence on depression. Abstract submitted to the Military Health Systems Research Symposium, 2021. Kissimmee, FL, August 23-26, 2021.
- 685. **Killgore, WD**, Silveri, MM. Finding the secret recipe for good sleep: Clues from brain neurochemistry. Abstract submitted to the Military Health Systems Research Symposium, 2021. Kissimmee, FL, August 23-26, 2021.
- 686. **Killgore, WD**, & Capaldi, VF (II). Extraversion is associated with increased suicidal ideation during sleep deprivation. Abstract submitted to the Military Health Systems Research

Symposium, 2021. Kissimmee, FL, August 23-26, 2021.

- 687. **Killgore, WD**, Dailey, NS, Vanuk, JR, & Raikes, AC. Morning blue light therapy for sleep and cognitive deficits following mild traumatic brain injury. Abstract submitted to the Military Health Systems Research Symposium, 2021. Kissimmee, FL, August 23-26, 2021.
- 688. **Killgore WD**, Ralston, KN, King, R, Dailey, NS, & Alkozei, A. Enhancing cognitive brain functions via light stimulation. Abstract submitted to the Military Health Systems Research Symposium, 2021. Kissimmee, FL, August 23-26, 2021.
- 689. **Killgore, WD**, Persich, MR, Cloonan, SA, Vanuk, JR, Dailey, NS, & Smith, R. Development and validation of a military emotional intelligence training program for enhancing emotional resilience. Abstract submitted to the Military Health Systems Research Symposium, 2021. Kissimmee, FL, August 23-26, 2021.
- 690. **Killgore, WD**, & Cloonan, SA. Increasing aggression during the COVID-19 lockdowns. Abstract submitted to the Military Health Systems Research Symposium, 2021. Kissimmee, FL, August 23-26, 2021.
- 691. Ralston, KN, King, R, Bullock, A, Alkozei, A, & **Killgore, WD**. Blue light therapy for sleep latency in individuals with PTSD: Sex differences. Abstract submitted to the Military Health Systems Research Symposium, 2021. Kissimmee, FL, August 23-26, 2021.
- 692. Satterfield, BC, Anlap, I, Esbit, S, LaFollette, KI, Lazar, M, & **Killgore, WD**. Corticotropin-releasing hormone receptor 1 gene polymorphism modulates cognitive flexibility following acute stress and total sleep deprivation. Abstract submitted to the Military Health Systems Research Symposium, 2021. Kissimmee, FL, August 23-26, 2021.
- 693. Persich, MR, Cloonan, SA, & **Killgore, WD**. Enhancing interoceptive awareness and dispositional mindfulness through a military emotional intelligence training program. Abstract submitted to the Military Health Systems Research Symposium, 2021. Kissimmee, FL, August 23-26, 2021.
- 694. Dailey, NS, Raikes, AC, Forbeck, BS, & **Killgore, WD**. Predicting neurocognitive function from structural neurocircuitry following mild traumatic brain injury. Abstract submitted to the Military Health Systems Research Symposium, 2021. Kissimmee, FL, August 23-26, 2021.
- 695. Dailey, NS, Le, AJ, & **Killgore, WD**. Identifying the relationships between post-concussion symptom severity, fractional anisotropy and neurocognitive function following mild traumatic brain injury. Abstract submitted to the Military Health Systems Research Symposium, 2021. Kissimmee, FL, August 23-26, 2021.
- 696. Lucas, DA, Cloonan, SA, Anlap, I, Bullock, A, Dailey, NS, & **Killgore, WD**. Increasing aggression in anxious COVID-19 positive individuals over the first six months of the COVID-19

pandemic: A cross-sectional analysis. Abstract submitted for presentation at the Society for Personality and Social Psychology Annual Convention (SPSP). San Francisco, CA, February 16-19, 2022.

697. Cloonan, SA, Persich, MR, Bullock, A, Anlap, I, Wellman, C, Swift, N, Johnson, J, King, R, Warren, M, & **Killgore, WD**. Further validation of an online, evidence-based emotional intelligence training program in a flexible, fully online setting. Abstract accepted for presentation at the Society for Personality and Social Psychology Annual Convention (SPSP). San Francisco, CA, February 16-19, 2022.

AWARDED GRANTS AND CONTRACTS

Completed

- 2001-2003 fMRI of Unconscious Affect Processing in Adolescence.
NIH,
1R03HD41542-01 PI:
Killgore
- 2003-2006 The Effects of Sleep-Loss and Stimulant Countermeasures on Judgment and Decision Making.
U.S. Army Medical Research and Materiel Command (USAMRMC) Competitive Medical Research Proposal Program (CMRP); Intramural Funding,
PI: **Killgore** (Total Award:)
- 2004-2005 Sleep/wake Schedules in 3ID Aviation Brigade Soldiers.
Defense Advanced Research Projects Agency
(DARPA) PI: **Killgore** (Total Award:)
- 2005-2006 Functional Neuroimaging Studies of Neural Processing Changes with Sleep and Sleep Deprivation.
U.S. Army Medical Research and Materiel Command (USAMRMC); Intramural Funding Task Area C (Warfighter Judgment and Decision Making) Program Funding
PI: **Killgore** (Total Award: .)
- 2006-2007 Establishing Normative Data Sets for a Series of Tasks to Measure the Cognitive Effects of Operationally Relevant Stressors.
U.S. Army Medical Research and Materiel Command (USAMRMC); Intramural Funding Task Area C (Warfighter Judgment and Decision Making) Program Funding,
PI: **Killgore** (Total Award:)
- 2006-2007 Military Operational Medicine Research Program (MOM-RP), Development of the Sleep History and Readiness Predictor (SHARP).
U.S. Army Medical Research and Materiel Command (USAMRMC); Intramural Funding

PI: **Killgore** (Total Award:)

- 2009-2014 The Neurobiological Basis and Potential Modification of Emotional Intelligence through Affective Behavioral Training (W81XWH-09-1-0730).
U.S. Army Medical Research and Materiel Command (USAMRMC),
PI: **Killgore** (Total Award:)
Major Goal: To identify the neurobiological basis of cognitive and emotional intelligence using functional and structural magnetic resonance imaging.
- 2011-2016 Effects of Bright Light Therapy on Sleep, Cognition, and Brain Function following Mild Traumatic Brain Injury (W81XWH-11-1-0056).
U.S. Army Medical Research and Materiel Command (USAMRMC),
PI: **Killgore** (Total Award:)
Major Goal: To evaluate the effectiveness of morning exposure to bright light as a treatment for improving in sleep patterns among individuals with post-concussive syndrome. Effects of improved sleep on recovery due to this treatment will be evaluated using neurocognitive testing as well as functional and structural neuroimaging.
- 2012-2014 Neural Mechanisms of Fear Extinction Across Anxiety Disorders
NIH NIMH
PI: Milad, M. Site Subcontract PI: **Killgore** (Subcontract Award:)
Major Goal: To examine the neurocircuitry involved in fear conditioning, extinction, and extinction recall across several major anxiety disorders.
- 2012-2014 Multimodal Neuroimaging to Predict Cognitive Resilience Against Sleep Loss
Defense Advance Research Projects Agency (DARPA) Young Faculty Award in Neuroscience (D12AP00241)
PI: **Killgore** (Total Award:)
Major Goal: To combine several neuroimaging techniques, including functional and structural magnetic resonance imaging, diffusion tensor imaging, and magnetic resonance spectroscopy to predict individual resilience to 24 hours of sleep deprivation.
- 2012-2015 Internet Based Cognitive Behavioral Therapy Effects on Depressive Cognitions and Brain function (W81XWH-12-1-0109).
U.S. Army Medical Research and Materiel Command (USAMRMC),
PI: Rauch, SL; Co-PI: **Killgore** (Total Award:)
Major Goal: To evaluate the effectiveness of an internet-based cognitive behavioral therapy treatment program on improving depressive symptoms, coping and resilience skills, cognitive processing and functional brain activation patterns within the prefrontal cortex.
- 2015 Effects of Blue Light on Melatonin Levels and EEG Power Density Spectrum
Arizona Area Health Education Centers (AHEC) Program
Co-PI: Alkozei, A.; Co-PI: **Killgore** (Total Award:)
Percent Effort: 0%
Major Goal: Adjunctive intramural funding to add a melatonin collection to an ongoing study of the effects of blue wavelength light on alertness and brain function.

- 2012-2020 A Model for Predicting Cognitive and Emotional Health from Structural and Functional Neurocircuitry following Traumatic Brain Injury (W81WH-12-0386)
 Congressionally Directed Medical Research Program (CDMRP), Psychological Health/Traumatic Brain Injury (PH/TBI) Research Program: Applied Neurotrauma Research Award.
 PI: **Killgore** (Total Award:)
 Percent Effort: 25%
 Major Goal: To evaluate the relation between axonal damage and neurocognitive performance in patients with traumatic brain injury at multiple points over the recovery trajectory, in order to predict recovery.
- 2014-2019 Bright Light Therapy for Treatment of Sleep Problems following Mild TBI (W81XWH-14-1-0571).
 Psychological Health and Traumatic Brain Injury Research Program (PH/TBI RP)
 Traumatic Brain Injury Research Award-Clinical Trial.
 PI: **Killgore** (Total Award:)
 Percent Effort: 40%
 Major Goal: To verify the effectiveness of morning exposure to bright light as a treatment for improving in sleep patterns, neurocognitive performance, brain function, and brain structure among individuals with a recent mild traumatic brain injury.
- 2014-2020 A Non-pharmacologic Method for Enhancing Sleep in PTSD (W81XWH-14-1-0570)
 Military Operational Medicine Research Program (MOMRP) Joint Program Committee 5 (JPC-5), FY13 Basic and Applied Psychological Health Award (BAPHA)
 PI: **Killgore** (Total Award:)
 Percent Effort: 35%
 Major Goal: To evaluate the effectiveness of blue light exposure to modify sleep in PTSD and its effects on fear conditioning/extinction, symptom expression, and brain functioning.
- 2017-2019 Emotional State and Personality: A Proof-of-Concept Model for Predicting Performance Under Stress (DM160347)
 USAMRMC 2015
 PI: **Killgore** (Total Award:)
 Percent Effort: 20%
 Major Goal: To develop a statistical model to predict effective cognitive performance under stress using personality and state emotion metrics.
- 2018-2020 Understanding the Mechanisms of Blue Light Exposure on Cognitive Performance
 USAMRDC
 PI: **Killgore** (Total Award:)
 Percent Effort: 4%
 Major Goal: To identify the subcortical systems responsible for acute cognitive improvement associated with blue light exposure in the scanner.
- 2020 Real-Time Caffeine Optimization during Total Sleep Deprivation
 USAMRDC
 Site PI: **Killgore** (Total Award:)
 Percent Effort: 40%

Major Goal: Determine the effectiveness of the 2B-Alert Caffeine Optimization Program during an in-laboratory sleep deprivation study.

Active

- 2016-2022 Refinement and Validation of a Military Emotional Intelligence Training Program (JW150005)
Joint Warfighter Medical Research Program 2015
PI: **Killgore** (Total Award:)
Percent Effort: 45%
Major Goal: To develop and validate a new internet-based training program to enhance emotional intelligence capacities in military Service Members.
- 2020-2022 Transcranial Magnetic Stimulation of the Default Mode Network to Improve Sleep
USAMRDC
PI: **Killgore** (Total Award:)
Percent Effort: 5%
Major Goal: Determine whether continuous theta burst stimulation of the default mode network can improve sleep among individuals with insomnia.

Understanding the Mechanisms of Blue Light Exposure on Cognitive Performance

Quad Chart - Final Report

W81XWH-19-1-0074



PI: William D. Killgore, Ph.D.

Org: University of Arizona

Award Amount: \$306,903.00

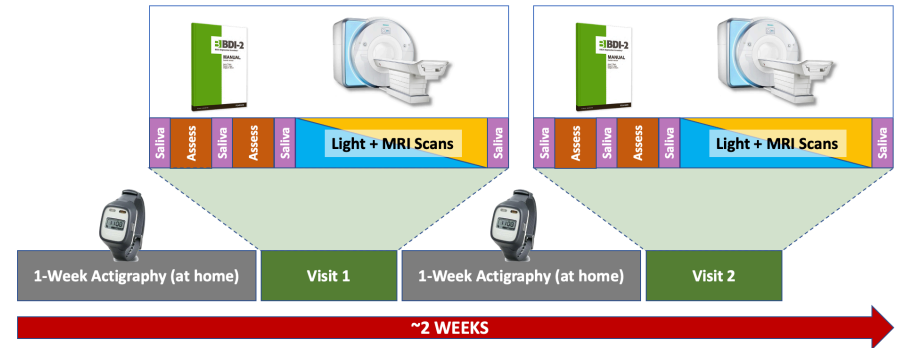
Study Aims

•**Specific Aim #1:** Identify the mechanism by which blue light exposure during the day leads to increases in alertness, cognitive performance, and mood in healthy individuals.

Approach

To identify whether norepinephrine is released as a function of blue light exposure, using combined functional magnetic resonance imaging and continuous measures of pupillary response. Establish how quickly these changes are apparent, and how they correlate with performance as well as functional brain activation changes on a working memory and emotional processing task.

Crossover design (N = 36)



Accomplishment: Data collection complete. Final report complete. Preliminary findings suggest short durations of blue light exposure produces significant changes in the default mode network (DMN) locus coeruleus (LC), which appear to enhance neural efficiency and cognitive performance.

Timeline and Total Cost (direct and indirect)

Activities	FY19	FY20	FY21
Preparation: Local IRB; USAMRMC HRPO; Program Development; Materials Acquisition; Training			
Data Collection: 36 participants complete crossover blue and amber placebo light exposure sessions separated by 1-week washout period.			
Data Analysis: fMRI, saliva, behavioral, eye tracking, and cognitive data will be analyzed; final report submitted.			
Estimated Total Budget (\$K)	170,750	78,341	0

Goals/Milestones

FY19 Goal – Study Preparation

☑ Obtain Materials, complete IRB approvals

FY20 Goal – Recruitment and Data Collection

☑ MRI compatible light device constructed

☑ Run development scans, begin recruitment

☑ Begin data collection

FY21 Goal – Continue Data Collection

☑ Complete data collection

☑ Conduct Data Analysis

Budget Expenditure to Date

Projected Expenditure: \$306,903

Actual Expenditure: \$ 306,903

Updated: DEC 22 2021

Transition Plan Questionnaire

Directions: Please answer all questions that apply for each product under development. Please fill out one document per product. This is not an application for funding; however, answers will help us understand the outcomes and products from your award.

1. After the award closes, would you be willing to periodically provide voluntary information (via email) regarding the project status (i.e. where the research is headed)? Yes ☒ or No ☐

These responses will help CDMRP demonstrate the return on its investments and will help demonstrate that the CDMRP is a responsible and successful steward of federal research funding.

2. What **conclusion(s)** does your final data support?

First, these preliminary findings suggest that acute exposure to blue light is potentially effective for sustaining or improving neural efficiency within the brain. We found that a brief exposure to blue light in the scanner was associated with significantly suppressed deactivation of the default mode network (DMN), a brain system that is usually disengaged by difficult cognitive effort. Amber light was associated with normal disengagement of this system, suggesting reallocation of resources to accomplish the task. However, blue light was associated with attenuation of this effect, suggesting that the brain was able to complete the task without reallocating DMN resources. This suggests that blue light allows the individual to sustain equivalent levels of cognitive performance without having to work as hard to accomplish the task. Second, exposure to the light sources had no effect on salivary melatonin levels, suggesting that the observed changes in acute brain activation were separate from the well-established responses of the melatonin rhythm to bright light. This suggests that blue light acts through a separate acute stimulating system that is independent of the circadian system. Finally, we found modest support for a potential activation of the locus coeruleus (LC) for blue light compared to amber placebo, providing preliminary support for our hypothesis that the acute effects of light are mediated by the norepinephrine system.

3. Will you/have you applied for/obtained follow-on-funding for this project? **If yes**, please list (a) funding organization, (b) total budget requested/obtained, and (c) title of the funded proposal. *This information will be recorded as an outcome to this award.*

Yes, we have applied for 7 follow-on studies over the past 18 months, but 4 proposals were already not selected for funding. At present we still have the following related projects under consideration:
FY21 PRMRP FPA, \$11,014,696: A Focused Program to Establish Practice Guidelines for Using Light Therapy to Facilitate Sleep
FY21-TBIPHRP-CTA, \$2,997,638: Regulating Mood and Suicidal ideation with Morning Light Exposure Treatment
FY21-TBIPHRP-CTA, \$5,939,944: A Precision Medicine Approach to Using Blue Light Exposure to Improve Sleep & Recovery in mTBI

4. What will be the **next step(s)** for this project?

1) We still have additional data that we are processing and analyzing. This includes several resting state functional MRI scans for each participant. These analyses are ongoing. All outcomes are being prepared for submission for publication and presentation.

2) We found that pupil size was not significantly influenced by the light wavelength and may not be an effective proxy for norepinephrine release and showed evidence of a habituation effect. We plan to explore this further with alternative methods in and out of the MRI scanner.

3) We plan to extend these findings to sleep deprivation and examine the effects of similar stimulation on performance without sleep and at alternate circadian times. We have also been extending these findings into the non-visible portion of the light spectrum.

5. How would you classify your **lead candidate product?** a

(a) Therapeutic (Small Molecule, Biologic, Cell/Gene Therapy): Biologic

(b) Diagnostic

(c) Device

(d) Research Tool to Address a Research Bottleneck

(e) Knowledge Product (Non-material product such as a compound library, database, something that improves clinical practice, education, etc.)

(f) Other - Please Specify:

6. How does your candidate product aid the Warfighter, Veteran, Beneficiary, and/or General Population?

Warfighters often must operate without sufficient sleep or at times that are at odds with their circadian phase. While pharmacologic agents, such as caffeine or other stimulants, can provide a cognitive advantage when sleep is lacking, these agents come with many adverse side effects. We have been researching alternative non-pharmacologic interventions to sustain performance under periods of extended wakefulness. Our findings suggest that precision-timed blue-wavelength light is effective at improving sleep, shifting the circadian phase, and modifying brain structure and function to optimize performance. If used correctly, at the appropriate time, and at the appropriate dose, the evidence suggests that blue light can facilitate performance, which would aid Warfighters by sustaining vigilance, reducing cognitive errors, enhancing safety, and even facilitating recovery from brain injury. The present study has advanced the understanding of these effects by identifying potential neural mechanisms of action. This project showed that a brief dose of blue light altered neural efficiency in the brain and appears to have activated a hypothesized brainstem region involved in norepinephrine release. With further research, we hope to identify the most effective timing and dose levels of blue light so that we can develop clinical practice guidelines for its optimal use with military personnel and other populations who struggle with alertness, sleep, or traumatic injuries.

7. Therapy / Product Development, Transition Strategies, and Intellectual Property

Describe the steps and relevant strategies required to move the candidate product (knowledge or tangible) to the next phase of development and/or commercialization. Please address any issues with intellectual property.

PIs are encouraged to explore the technical requirements and the current regulatory strategies involved in product development as well as to work with their organization's Technology Transfer Office (or equivalent regulatory/legal office), federal/international regulatory experts, to develop the transition plan and to explore developing relationships with industry, DoD advanced developers (e.g. USAMMDA), and/or other funding agencies to facilitate moving the product into the next phase.

Sleep and circadian rhythm disorders are among the most common complaints of Service members. Less than a third of Service members obtain the recommended amount of sleep each night, most report regularly obtaining five or less hours per night due to work demands or emotional issues. However, evidence suggests that circadian rhythm disruptions can be modulated by precisely timed exposure to light. Preliminary data suggests that blue light (BL) therapy can help to regulate circadian rhythms, promoting better quality of sleep. We hypothesize that daily morning BL will re-entrain the circadian rhythm to improve sleep quality and consequently improve mental health outcomes, including suicidal ideation. We propose that this can be accomplished with a simple approach that uses an easy to wear light device each morning. While there are many types of commercially available light exposure devices on the market, our goal has not been to develop a device, but rather to research the effects of BL on the brain and behavior.

After study completion, we plan to establish working relationships with companies such as AYO, Re-Timer, Philips, or other similar light device companies who can manufacture goggle-based light-emitting devices on a large scale. These relationships will be established and maintained through Tech Launch Arizona, the technology transfer office at the University of Arizona. We have been working with Tech Launch for several years to develop and modify ongoing transition strategies. To accomplish the ultimate goals of the program, the post-award transition will follow these outlined stages:

1) Short-Term (0-2 years): Information resulting from the current project will be shared with the larger military and scientific communities through peer-reviewed publications and presentations at scientific conferences. The data bases and summary data elements will be provided to our science officer at USAMRDC and provided to others upon reasonable request. We plan to develop a set of clinical practice guidelines to aid clinicians and leaders in the use of light exposure approaches. These "preliminary guidelines" for the use of generic BL treatment will likely be made available for clinicians via the peer-reviewed literature and conference presentations. We foresee general guidelines becoming available within the first two years following completion of the project.

2) Mid-Term (2-5 years): Over the next several years, we aim to expand the scope of the project to further clarify the use of BL approaches and its uses in a greater variety of settings. This will involve expanding our research to a broader range of 1) exposure devices (i.e., goggle versus light box vs environmental illumination systems), 2) illuminance/irradiance parameters (e.g., identifying the fewest number of diodes necessary to maintain the effect), 3) timing/dosing parameters (i.e., number of minutes per day; optimal timing following waking; number of days of treatment necessary to optimize effects; durability of effects post-treatment; effects of booster doses). There is growing evidence that light exposure approaches may be effective for other conditions such as improving cognition in people with certain forms of dementia. We will seek follow-on funding from USAMRDC and the Office of Naval Research (ONR) to test the models in several military treatment facilities with Service members with clinically diagnoses sleep apnea, insomnia, and other sleep disorders.

We have extensive collaborations with individuals in the military and industry to accomplish these goals and maintain continuity of development. Our research team includes four active-duty Army Research Psychologists, each with extensive experience in military psychiatry, traumatic brain injury, and neuroscience, and we have a long history of working closely with many military researchers in the fields of sleep and psychiatry. Additionally, we have agreements with AYO, the company that makes the light devices, to continue with research in this area. AYO has been very accommodating in our research efforts. These established collaborative relationships with Army leaders involved in human performance, neuroscience, and military psychiatry will be critical to coordinating follow-on research. Thus, within the mid-range period (i.e., within 5 years of the commencement of the proposed project) we anticipate having answered most of these critical questions and will have disseminated this information widely in the scientific literature and through specific reports provided to USAMRDC.

Intellectual and Material Property

All intellectual and material property issues have been and will be coordinated through Tech Launch Arizona, the technology transfer office of the University of Arizona. For the current project, we anticipate only knowledge products, and all intellectual property will reside jointly with the USAMRDC and the University of Arizona, but the military would be free to incorporate the information into their systems as appropriate. As mentioned previously, the light delivery devices we propose to use are already commercially available and there would be no need for additional modification or production. Such units could be purchased directly from the commercial manufacturer. The Investigators under this proposal will make unique research resources readily available for research purposes to individuals within the scientific community after publication. The University of Arizona will assure the timely release and sharing of data no later than the acceptance for publication of the main findings from the final dataset. They will protect the rights and privacy of human subjects who participate in the federally sponsored research by redacting all identifiers and adopting other strategies to minimize risks of unauthorized disclosure of personal identifiers in accordance with authorization and consent documents. We envision that our findings will lead to published clinical practice guidelines of BL therapy for sleep disorders and mental health issues, tailored to military use, and be provided to the military at no cost.