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Changing Behavior and Renewing the Brain: A Study of College Students

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Abstract
The field of neuroscience and religion continues to explode as researchers seek to understand religious experiences in the brain. Studies in religious experience, called *neurotheology*, attempt to draw conclusions about the truth of these religious experiences from the study of biological brain events. Given the substantial research on the science of religion, this article explores the physiological changes of college students engaged in regular spiritual practices. Students were asked to engage in intentional spiritual formational practices, such as prayer, meditation, Scripture reading, and contemplation, to see if these practices impacted their physiological activities, including brain wave, heart rate, skin response (sweat), and reaction time changes. A variety of neuropsychological measures such as the Beck Depression Inventory, State/Trait Anxiety Scale, heart beats per minute, galvanic skin response, and electro-physiological encephalography measures were gathered at the beginning and the end of the course to measure physiological activity. The purpose was to discover whether students' physiological measures changed as a result of spiritual formation practices. This study has implications for Christian educators: As persons engage in regular contemplative practices, this can result in behavioral changes in the brain.

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Introduction

The field of neuroscience and religion continues to explode as researchers seek to understand religious experiences in the brain (Hick, 2010; McNamara, 2014; Nelson, 2010; Newberg, 2010). Studies in religious experience, called *neurotheology*, attempt to draw conclusions about the truth of these religious experiences from the study of biological brain events (Alston, 2007; Newberg, 2010). On the surface, it may seem that these recent developments could cause some Christians concern about providing scientific proof for "religious experience." However, science could provide a basis for understanding how practices such as meditation and prayer impact the brain.

The question of religious experience and brain activity provides a fascinating field of study. Studies show that whether drug induced, seizure related, magnetically stimulated, or born of normal brain processes, religious experiences remain clearly tied to physical brains (McNamara, 2014; Newberg, 2010). Some neuroscientists attempted to "locate" religious experience in one particular brain module or wiring system but later realized that different religious experiences impact different parts of the brain (Newberg & Waldman, 2010). However, most neuroscientific research suggests that religion cannot be reduced to a primary form of cognitive activity, such as language. Religion exists more as a cultural and social phenomenon that includes a variety of individual group experiences, events, and activities (Jeeves & Brown, 2009, p. 99; McNamara, 2014).

Studying the impact of meditation on brain activity provides an area of exploration in neuroscience and religious experiences. Andrew Newberg and Mark Waldman (2010), at the University of Pennsylvania and the Center for Spirituality and the Mind, conducted one of the most extensive studies of neuroscience and religious experience. For several years they studied how different concepts of God affect the human mind (p. 6). They evaluated brain scans of Franciscan nuns as they immersed themselves in the presence of God, and charted the neurological changes as Buddhist practitioners contemplated the universe. They studied the brains of Pentecostal practitioners who invited the Holy Spirit to speak to them in tongues, and viewed how the brains of atheists react, or do not react, when they meditate on a concrete image of God (p. 6). Newberg and others mapped the neurological changes caused by spiritual and religious practices. Their results have led to the following conclusions:

- Current research in the field of neuroscience and spirituality suggests that meditation enhances the neural functioning of the brain in ways that improve physical and emotional health.
- Long-term contemplative practices strengthen a specific neurological circuit that generates peacefulness, social awareness, and compassion for others.

- Some neuroscientists claim that spiritual formation practices improve memory and can slow down neurological damage caused by old age.
- Meditation and contemplation of God can change the structures of the brain that control moods, give rise to the conscious notions of self, and shape the sensory perceptions of the world.

Newberg and Waldman's (2010) study suggests that religious and spiritual contemplation changes the brain in profound ways by altering the neural circuitry, which in turn results in enhanced cognitive health. Their research suggests that long-term contemplative practices strengthen a specific neurological circuit that generates peacefulness, social awareness, and compassion for others. Furthermore, Sharon Begley (2007) believes that the human brain has the capacity to rearrange itself and be changed through meditation. Neuroplasticity is the mechanism that allows these changes to occur in the brain. Religious experience is cognitively structured where thoughts-beliefs play a central role. Neuroscience research suggests that religious experiences are associated with patterns of brain activity, but no specific brain area mediates religious experience (Jeeves & Brown, 2009; McNamara, 2014; Newberg & Waldman, 2010).

Given the substantial research on the science of religion, this article explores the physiological changes of college students engaged in regular spiritual practices. Students were asked to engage in intentional spiritual formational practices, such as prayer, meditation, Scripture reading, and contemplation, to see if these practices impacted their physiological activity, including brain wave, heart rate, skin response (sweat), and reaction time changes. A variety of neuropsychological measures such as the Beck Depression Inventory, State/Trait Anxiety Scale, heart beats per minute, galvanic skin response, and electrophysiological encephalography measures were gathered at the beginning and the end of the course to measure physiological activity. The purpose was to discover whether, as students developed more mature formation of spiritual disciplines, their physiological measures changed as a result of spiritual formation practices.

Case Study Hypothesis

Students were introduced to inward or contemplative practices for the study. They were asked to engage in an inward practice 20 minutes per day, seven days a week, for four weeks. The practices included contemplative prayer; centering prayer; silence and solitude; journaling; meditation; visualization through icons, images, and music; Scripture meditation; and *lectio divina* (sacred reading) (Calhoun, 2005; Jones, 2005; Leclerc & Maddix, 2011). The focus on contemplative spirituality has often been linked with the mystical dimension of faith to see the inner harmony of all things and denies any dualistic notion of life that opposes spirit and matter. The contemplatives have searched for God in solitude (hermetical tradition) and in communal settings (monastic tradition).

Given the unique setting of a cohort experience and using research conducted on the effects of meditation on the brain, the researchers hypothesized that changes could occur in the physiological and psychological measures of the college students but were not certain that the varied spiritual disciplines, including meditation done for only 20 minutes each day, could result in the same change in brain waves. In order to control for the experience of being engaged in college courses and participating in the electroencephalogram (EEG) portion of the research contributing to any changes, a control group was created from students at the same university who were not involved in the cohort experience. The independent variable (intervention) was participating in a cohort-model course during which students participated in spiritual disciplines 20 minutes each day for a four-week period. The control group consisted of undergraduate students who were not in a specific course nor were they participating in spiritual disciplines as taught in the course. The dependent variables included pre- and post-measurements of 12 brain wave sites (mean power), galvanic skin response (microsiemen), and heart rate (beats per minute), as well as pre- and post-measurements of anxiety and depression.

Methods

Participants

Students were recruited from a traditional undergraduate university population. Recruiting announcements were emailed to the undergraduate student body at the time of scheduling for the following semester. The course description was included along with the format for the course structure. The experimental group consisted of male and female undergraduate students ($n = 38$) enrolled in a seven-week course on the history of spiritual practices and neuroscience offered during the first seven weeks of the spring semester for two consecutive years. The control group participants ($n = 22$) were recruited from the same pool of traditional undergraduate students. These students were not enrolled in any specific course or engaged in any directed meditation or spiritual disciplines. Pre- and post-measurements were gathered in the first seven weeks of the fall semester with four weeks in between the measurements. Students from both groups were from a variety of majors, but primarily social sciences, humanities, and religion. The age range was 17–42 with a mean age of 23 years. The median age was 21. Of the original 62 students completing the pre-testing, two were omitted from analysis due to not returning for the second testing session. This research was approved by the Northwest Nazarene University institutional review board.

Methodology

The Beck Depression Inventory II (BDI; Beck, Steer, & Brown, 1996) and the State-Trait Anxiety Scale (STAI; Spielberger, 1983) are self-reporting behavioral and mood measures used to establish similarities in mood states between the control and experimental groups. They were also used to evaluate changes across the first five weeks of the semester. The manual norms for college students were used for both the BDI and STAI to determine level of mood and anxiety in the groups. The BDI is a well-researched self-report measure to evaluate behaviors from the three primary domains of depression: physical, cognitive, and emotional. Test-retest reliability for the BDI has been established for a variety of patient and control populations ranging from .74 to .93 (Kaszniak & Allender, 1985). In addition, several concurrent validity studies have reported coefficients ranging from .57 to .91 depending on the population (Lezak, 1995). Beck, Steer, and Carbin (1988) report coefficients ranking from .60 to .74 with nonpsychiatric participants. The STAI is also well vetted in terms of validity and reliability. Internal consistency coefficients range from .86 to .95; test-retest reliability coefficients range from .65 to .75 (American Psychological Association, n.d.)

Students used a daily record sheet to record the quantity and quality of their sleep, type of spiritual discipline, beginning and end time of the discipline, any naps taken during the day, amount of caffeine consumed, and self-rating of mood. Students kept the records daily and turned them in each week.

Spiritual disciplines were taught (including origin and techniques) during the course. During the first four weeks of the course, students were instructed to practice one specific spiritual discipline (silence and solitude, visual meditation, silent prayer, reading Scripture). During the final two weeks, students were allowed to choose one discipline for the week. Students selected the time each day for the 20-minute discipline.

All physiological measurements were gathered using the Biopac data acquisition system, M150. A two-channel galvanic skin response (GSR) was used to measure microsiemen (sweat) changes during the rest and cognitive task pre- and post-meditation period. A two-channel electrocardiogram (ECG) was used to record heart rate (BPM) during the rest and cognitive tasks for both pre- and post-testing. Millivolts were recorded from a 12-channel EEG during the task for pre and post. Four frontal lobes (F3, F4, F7, and F8), two temporal lobes (T3, T4), and two parietal lobes (P3, P4) were recorded and analyzed. Two occipital lobes (O1, O2) were also recorded because we were using a visual task for stimulation. FP1 and FP2 were used to monitor possible interference from eye-blinks. The reference points were the participant's earlobes on which single gold electrodes were placed. Mean power was averaged from the microvolt readings for each phase of the stimulus presentation (rest, color word, emotion word, inhibition, post-rest). Mean power is a general measure of the electrical activity emitted from the brain neurons during activity. This is measured in "areas" rather than specific points.

SuperLab 4.5 software (Biopac Systems, Inc.) was used for presentation of the rest stimulus, instructions, and visual cognitive task. A static picture of tulips was projected on the computer monitor for the rest period. The participant sat approximately 53 cm from the monitor. The keyboard was on the table between the participant and the monitor stand. For the rest phase, the picture was shown for five minutes. In phase 1, color (e.g., blue, green, maroon) or non-color words (e.g., truck, tree, pencil) were shown on a computer monitor at eye level of the participant. Emotion words (e.g., sad, disgusted, happy) were introduced during trial 2 of the color word task, but no specific instructions were given. A legend for key strokes was taped to the bottom of the monitor for reference. The words were randomized for each trial of three trials. The words were all in black ink, in lower-case letters and 48-point font, and centered on the monitor. For phase 3, an adaptation of the Stroop task (obtained from Biopac) was used. There were five trials within the Stroop task: black color words (e.g., black, red, green), color xxx, colored words (read the word), colored words (say the ink color), and black color words. The words were shown on the screen until the participant pressed a key. Correct responses and response time were recorded for the phase 2 task. Response time only was recorded for the Stroop task.

Acqknowledge EEG analysis software (Biopac Systems, Inc.) was used to analyze all the physiological recordings. SPSS statistics software was used to analyze the data.

Procedure

On the initial day of class, a research assistant invited students enrolled in the spiritual disciplines and neuroscience course to allow their data to be used in the study. Since students were using their pre- and post-recordings to write their paper for the course, it was considered important that the research assistants explain the procedure to students and gain consent while the professors were out of the classroom. The research assistants scheduled appointments for pre-recordings with each student. All students in the course completed the BDI and STAI in class and turned them in to the research assistants for scoring. Students arrived individually at their appointed time to the psychology lab for the physiological recordings. They were given a code and all data were recorded using the code. The master list was kept by the research assistants in a locked location.

During the rest phase, students were instructed to look at the picture on the monitor and relax. No further instructions on how to relax were provided. During the color word task, students were instructed to focus on the "+" in the middle of the screen and read the words that appeared. If the word was a color word, the student was instructed to press the "c" key on the keyboard. If the word was a non-color word, students were instructed to press the "n" key as quickly as possible. During trial 2 of the color word tasks, emotion words appeared but students were not instructed to act on these words. The color words included more challenging words (e.g., russet, chartreuse). During trial 3, students were instructed to continue pressing "c" for color words, "n" for non-color words, and also "b" for emotion words. During the Stroop phase, students were instructed to press keys (z, x, c, v, b) that were representing each color on the legend taped to the monitor.

Students in the experimental group continued with the course. During each weekly class session, the spiritual disciplines were taught and practiced. These disciplines included meditation, silence and solitude, silent prayers, silent reading, and journaling. Students were encouraged to use one discipline each week rather than changing during the week. During the fourth week of class, the research assistants again set appointments for testing. The BDI and STAI were again completed in class. Students scored their own BDI and STAI during class guided by the professor. They turned in their scores to the research assistant. Research assistants analyzed the EEG, ECG, and GSR data. Individual scores were provided to each student for writing her or his reflection paper for the course. The preliminary findings were discussed during the final class session.

Students participating in the control group were recruited through announcements in psychology and religion courses. The research assistants set appointments for those who responded. These students signed consent forms and completed the BDI and STAI in the lab since they were not in a single course as a group. The physiological measures were taken using the same programs and recordings as the experimental group. At the end of the session, the next session was scheduled for four weeks later. Students were sent email reminders for the post-session. These students were invited to attend a presentation of the data that occurred in the spring semester.

Results

Psychological Measures

The data were analyzed using 2(group)X2(pre-post) repeated measures ANOVAs for each dependent variable (BDI score, State score, Trait score).

Pre-testing: BDI and STAI. There is a significant difference in the BDI scores between groups before the intervention, $t(58) = 2.497$, $p = .015$, $Me = 8.99$, $Mc = 4.59$). Although statistically different, both of these values are well below the clinical cutoff score for the BDI; thus, both groups were within the normal range for mood. In addition, the BDI scores were not correlated with any of the EEG variables and thus would not be considered a confounding factor with the EEG readings.

There is no difference in the state anxiety levels between the experimental and control groups prior to the intervention, $t(53{,}743) = 1.717$, $p > .05$, ($Me = 36.03$, $Mc = 31.41$). Both means were within the average range for college students.

There is a significant difference in trait anxiety between the experimental and control groups prior to the intervention, $t(55.99) = 3.856$, $p = .0001$, ($Me = 41.49$, $Mc = 32.67$). The experimental group mean falls above one of the suggested cutoffs for anxiety.

BDI and STAI pre-post. There is a main effect for “time” for the BDI, $F(1,53) = 4.617$, $p = .036$. There was a significant decrease in BDI scores (the full group) at the post-testing, $Mpre = 7.02$, $Mpost = 5.6$. There is no significant interaction between the groups and the times for the BDI, $F(1, 53) = .042$, $P < .05$.

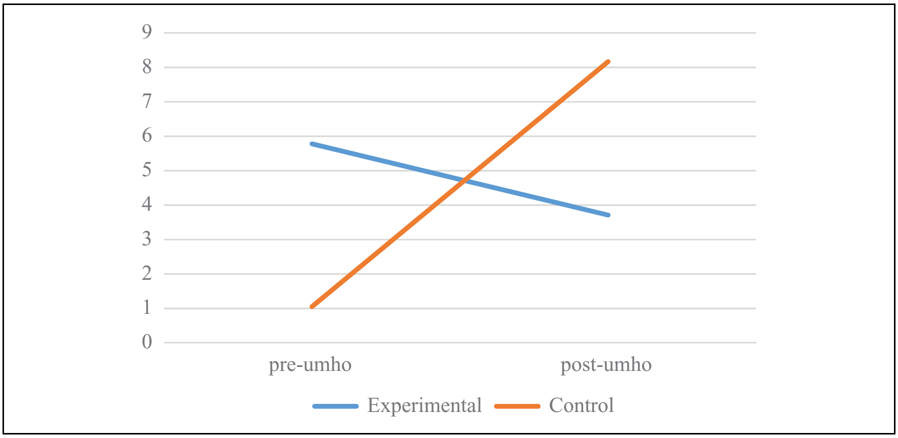

Figure 1. GRS measurement: Pre-post across conditions.
Note: GSR measurements (umho) occur in reversed directions when the experimental and control groups are compared across all cognitive conditions. This suggests that while the experimental group experienced decreased arousal during the post-intervention measurement, the control group experienced increased arousal during the rest phase.

There is no main effect for time (pre, post) with state or trait anxiety scores. There is no significant interaction between time and group for state or trait anxiety scores.

Physiological Measures

The data were analyzed using 2(group)X2(pre-post)X3(phase) ANOVAs for GSR values and BPM values.

GSR – Rest. There was a significant interaction between time (pre, post) and groups for GSR, $F(1,55) = 11.071$, $p = .002$. The experimental group GSR decreased after intervention whereas the control group increased (see Figure 1).

GSR – Color. There is a main effect for time for GSR umho, $F(1,55) = 5.133$, $p = .027$, ($M_{pre} = 5.41$, $M_{post} = 7.18$). The umho increased after the four weeks. There is a significant interaction for GSR between time and group, $F(1,55) = 10.710$, $p = .002$ (see Figure 2).

GSR – Stroop. There is no main effect for time. There is a significant interaction between time (pre, post) and group for the Stroop GSR measures, $F\ (1,55) = 7.507$, $p = .008$ (see Figure 3).

Heart Rate (BPM) – Rest. There is a main effect for time, $F(1,\ 53) = 8.487$, $p = .005$. There was a significant decrease in BPM during the second testing ($M_{pre} = 79.24$, $M_{post} = 73.24$). There was no significant interaction between time and group and no group difference in heart rate.

BPM – Color. There is a main effect for time, $F(1,\ 53) = 7.100$, $p = .01$. There was a significant decrease in BPM during the second testing ($M_{pre} = 81.998$,

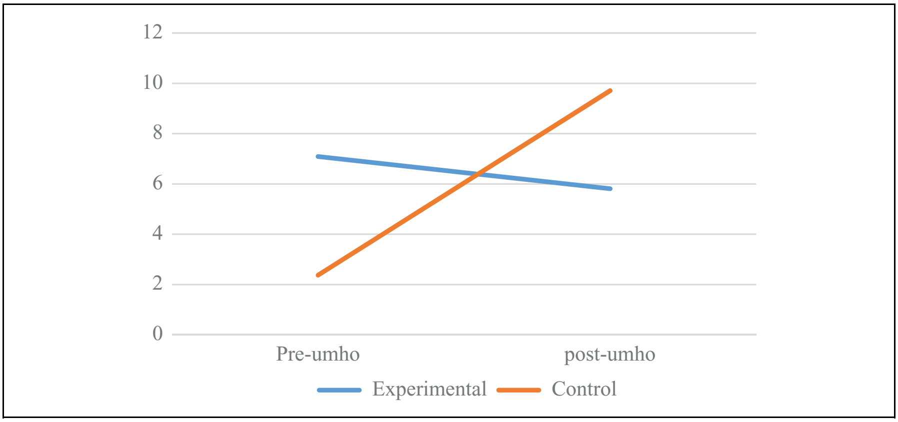

Figure 2. GSR measurements: Color word task.

Note: The GSR umho decreased significantly during the color word task for the experimental group after daily spiritual disciplines and increased significantly for the control group after the four weeks. As the cognitive task increased in difficulty, the experimental group was able to keep their arousal level (microsiemens) lower than during the initial measurements and lower than the control group.

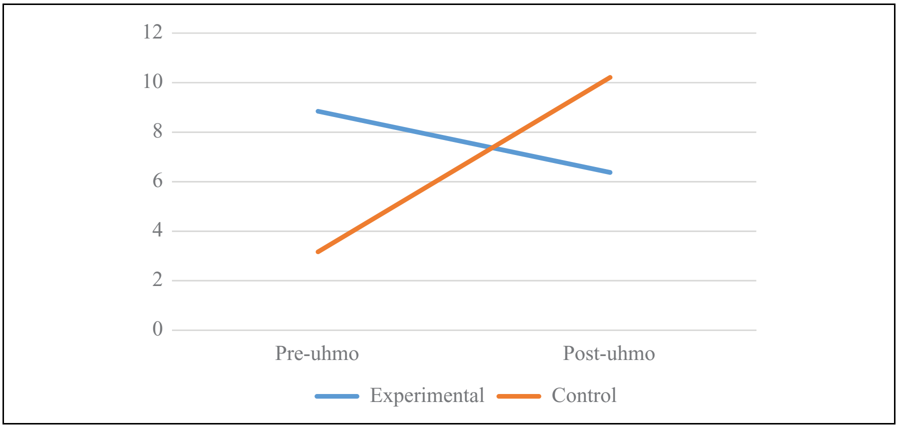

Figure 3. GRS Stroop-like task.

Notes: Those in the experimental group significantly decreased their GSR measures after four weeks of spiritual disciplines. Those in the control group had a significant increase in GSR umho over the four weeks of academics only.

Mpost = 76.092). There was no significant interaction between time and group and no group difference in heart rate.

BPM – Stroop. There is a main effect for time, $F(1, 53) = 7.793$, $p = .007$. There was a significant decrease in BPM during the second testing (Mpre = 83.297, Mpost = 77.705). There was no significant interaction between time and group and no group difference in heart rate.

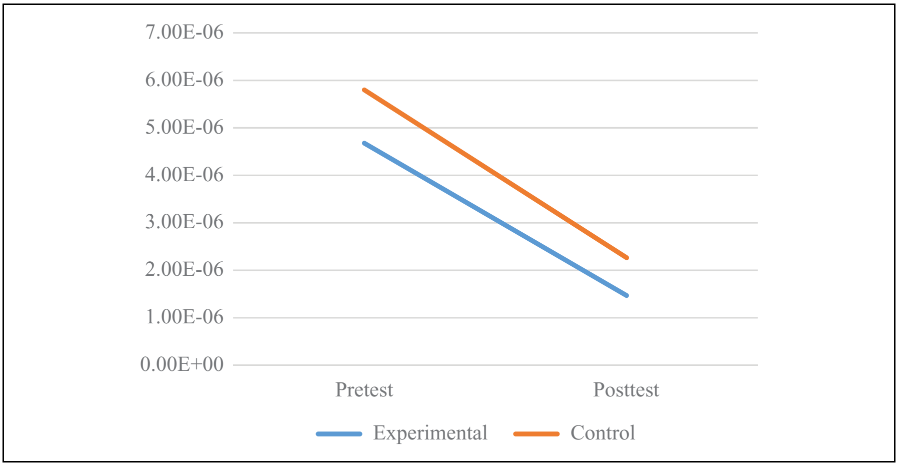

Figure 4. Two-way interaction for group and trial, left frontal medial.
Note: Both groups show a decrease in mean power in left frontal activity with the post-testing. The experimental group change is significant. Lower mean power, while able to continue accurate cognitive activity, suggests less energy is necessary to complete the activity. Both groups show less energy probably due to familiarity with the task. The experimental group change is a significant difference.

Electroencephalogram (EEG)

The mean power data were adjusted using syntax in SPSS in order to be able to conduct the analysis. A 2(group)X2(pre-post)X3(phases) MANOVA was completed using each of the ten electrode areas measured.

Temporal Lobe. No main effects or interactions occurred in the left or right temporal lobes.

Frontal lobe left (medial). There is a main effect for trial, $F(1, 54) = 6.055$, $p = .017$ (Mpre = 9.09883E-7mv, Mpost = 6.3659E-7mv). There was more activity in the left frontal during the post-testing. There is a main effect for group, $F(1,54) = 11.609$, $p = .001$ (Me = 4.368E-7mv, Mc = 1.425E-6mv). The control group had higher levels of electrical activity than the experimental group. There is a significant interaction between group and trial, $F(1, 54) = 12.374$, $p = .001$ (see Figure 4). There is a significant three-way interaction between group, trial, and phase, $F(2, 108) = 3.472$, $= .037$ (see Figure 5).

Frontal lobe right (medial). There is a main effect for trial $F(1,53) = 4.686$, $p = .035$ (Mpre = 2.97327E-6, Mpost = 2.107E-7). There was less electrical activity at the post-test for the full group.

There is a main effect for condition, $F(2, 106) = 7.427$, $p = .001$ (Rest = .000002163, Color = .0000023747, Stroop = .0000030279). There was increased activity with each condition for the full group when comparing pre- and post-testing. There is a significant interaction for condition X group, $F(2, 106) = 2.993$, $p = .054$.

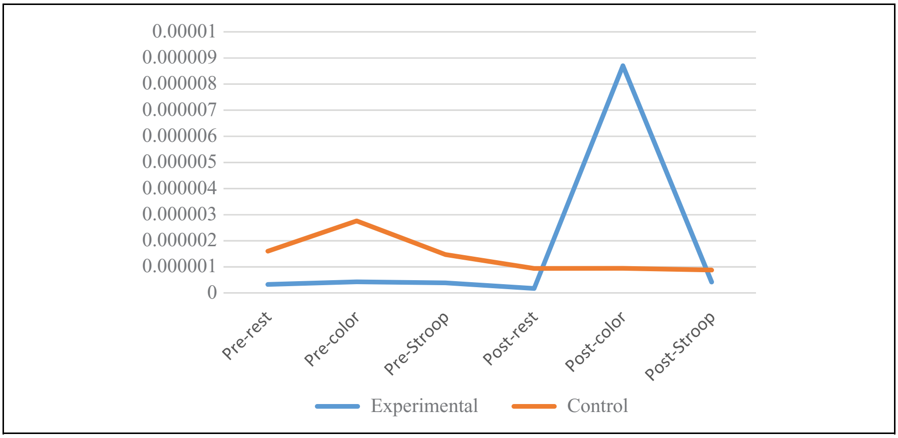

Figure 5. Left frontal trial X group X phase.
Note: The experimental group exhibited less electrical activity than the control group across all conditions except post-color. Looking at patterns within the groups, there is a decrease for the control group for all conditions. This may be a learning effect. The exception is with the color (light cognitive load) for the experimental group. This group increases the electrical activity following the four weeks of spiritual discipline. There is no change in activity for the Stroop for the experimental group.

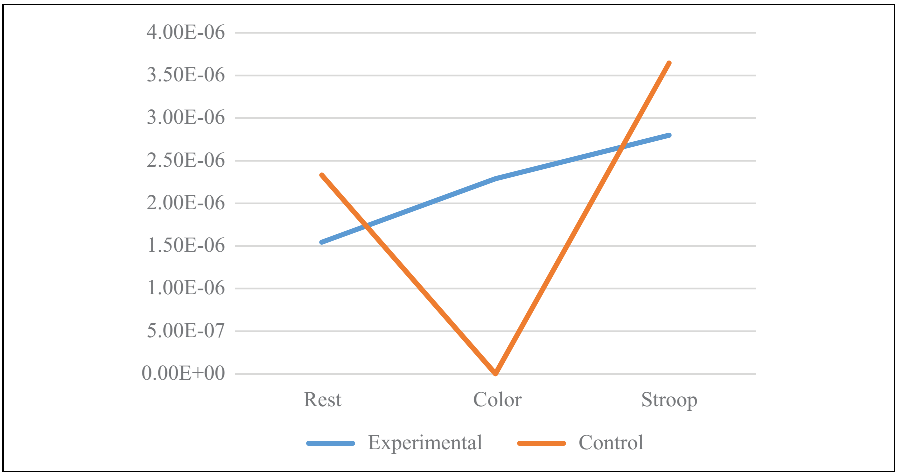

Figure 6. Right frontal (F4) group X condition.
Note: The experimental group increases electrical activity for each additional cognitive load (condition). The control group shows a decrease for the light cognitive load.

There were no main effects or significant interactions for the right or left lateral frontal measurements (F7, F8).

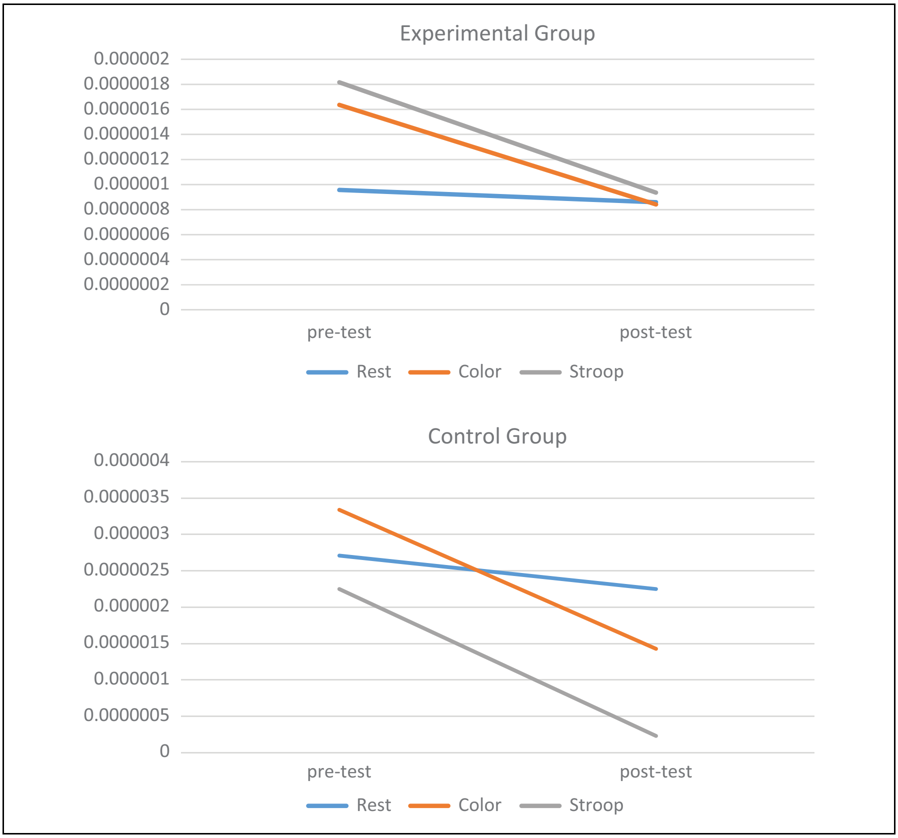

Figure 7. Right parietal trial X condition X group.
Note: More electrical energy is used by the control group for both pre and post. Looking at the patterns of changes between pre and post, the control group experienced decreased electrical activity for the rest and color conditions but not the Stroop. The experimental group experienced decreased electrical activity for the higher cognitive functions of color and Stroop conditions.

Parietal lobe left. There is a main effect for trial $F(1, 53) = 4.516$, $p = .038$.

Parietal lobe right. There is a three-way interaction for trial X condition X group $F(2,108) = 3.296$, $p = .041$ (see Figure 7).

Discussion

Can psychological and physiological measurements be altered within four weeks by introducing the use of spiritual disciplines for 20 minutes each day? That was the question asked at the beginning of this research. The research of neuroscientists has suggested that brain waves and heart rate can be changed when a person is in a state of meditation (Newberg & Waldman, 2010). Also, studies suggest that a person trained by a meditation expert or guru can experience physiological changes (Newberg & Waldman, 2010). Can these disciplines affect the psychological well-being and physiological status, including brain energy, when done by a person individually for merely 20 minutes per day? These results suggest this is possible.

The preliminary results from the first experimental group were presented to a group of professionals where it was suggested that maybe just being in college, taking courses through the first month of the semester, was the reason for the changes we found. The additional research suggests that this is not accurate. None of the psychological or physiological measures improved for the control group alone. The BPM decreased between pre-testing and post-testing for the entire sample. It is possible that this change was due to the initial novelty of having the electrodes placed and proceeding through the first testing. Novelty and familiarity do not explain the improved mood of the students in the experimental group as measured by the BDI. It is possible that mood symptoms were improved due to the experience of the course rather than the spiritual disciplines, or a combination of the course and spiritual disciplines may have resulted in the significant increase in mood.

The results of the GSR provide some additional support for the positive effects of daily spiritual disciplines. Even with the increase in the cognitive difficulty of the stimulus task, the GSR of the experimental group decreased while it increased for the control group when comparing the pre- and post-test measurement. If general anxiety decreased and well-being increased due to the use of daily centering and focusing on spiritual matters, it makes sense that the GSR would reflect this positive effect. This also indicates that merely attending college does not account for the changes seen in this study.

Although the stimulus tasks increased in cognitive load, the tasks were not overwhelmingly difficult. The trials for the tasks were randomly presented each time so learning and memory were not being measured. The increased mean power demonstrated especially in the right frontal lobe is consistent with the increasing cognitive load from rest, tosimple response to color words, to the complex inhibition task of the Stroop-like task. This increase in cognitive effort was evident for the full group both at the pre-intervention and post-intervention testing, suggesting that the stimulus had validity.

Although brain functioning is interconnected, there are some tasks that seem to rely on one area of the brain more than others. For example, the language center seems to be predominantly a left hemisphere functioning for the majority of people (Gazzaniga, Ivry, & Mangun, 2002). A person's memory involves areas of both hemispheres, beginning with working memory in the frontal lobes (Baddeley, 1986, 2010), yet memory for verbal information tends to be performed in the left hemisphere and memory for visual information tends to rely on the right hemisphere functioning. With tasks that can become automated (e.g., performances), humans begin learning using the more sequential left hemisphere and then need less energy after the task is learned. When a person is feeling anxious or struggling with high levels of stress, cognitive tasks become more challenging because the response to it causes us to think more attuned to less developed cognition using more attuned to a "beginner" using more of the sequential left hemisphere and the frontal lobe. This would lead to higher levels of energy from the left hemisphere. As anxiety or stress response decreases, the same cognitive task should require less energy and thus the mean power measured with the EEG would decrease.

EEG has been used to determine aspects of language, including purely semantic and simple lexical, using meaningful and non-words (Noggle & Dean, 2015). Temporal, parietal, and frontal areas all appear to be involved in the various language processes. The parietal lobe is partially responsible for the ability to attend (Gazzaniga, 2004; Yin et al., 2012). The experimental group had decreased energy in the right parietal lobe for the two cognitive tasks (color word and Stroop-like), whereas the control group decreased only for color word. Since the accuracy of the responses did not decrease on the post-test trial, it might suggest that the influence of using spiritual disciplines led to more efficient use of neuronal energy for focusing and inhibition. Thus, the mind was less distracted due to the influence of the practice of spiritual disciplines, and less neuron activity (energy) was needed in order to attend to the cognitive tasks including the complex cognitive load of the Stroop-like task.

There are several questions about meditation and brain waves that need to be answered by further research, but what is notable from this study is that brain wave changes occurred, depressive symptoms decreased, "anxiety" as measured by galvanic skin response decreased, and students anecdotally reported positive changes in sleep, attention, concentration, and self-efficacy. These outcomes occurred as a result of a mere 20 minutes of meditation each day within four weeks. The takeaway message would seem to be that we can positively change our brain activity with a minor change in behavior. Spiritual disciplines not only focus us toward our relationship with God, but in doing so can also positively affect our mood and improve the efficiency of our cognitive functioning. It would be interesting to see what changes occur if these practices were measured after six months, one year, five years, or 25 years of practice.

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