

The Effect of Group Ritual on Brain Function

Research Objectives



The study we are proposing will be the first-ever evaluation of group ritual on brain function.

A growing number of brain imaging studies have examined individuals performing practices such as meditation, prayer and other spiritual practices. These studies have led to a deeper understanding of the neurophysiological effects of such practices. In addition, studies have also explored the cognitive, emotional, and experiential elements of the experiences.

Many spiritual traditions also invoke group practices, however, and far less data has been generated about this aspect. The Catholic mass, Sufi whirling, Yoruba ritual drumming and Hindu mantra chanting all derive part of their effect and meaning from being practiced in a group. During such group rituals, the individuals can have very powerful experiences that share many of the same features as the individual practices, but previous studies have never focused on how group dynamics influence limbic and endocrine system functions.

Spiritual practices elicit changes in the autonomic nervous system that regulate heart rate and blood pressure, and data consistently supports this finding. The limbic structures and other parts of the brain are also involved. In particular, areas that are associated with emotions, the sense of self and the sense of meaning all can be affected. Our prediction is that group rituals, such as large congregations of individuals singing or dancing, will activate many of these same areas. In addition, given the group context, we would expect that there would be a resonance or entrainment of the individual brains all performing the same ritual.

We propose to document this effect of group rituals on the brain. This data will help demonstrate the similarities and differences between group and individual rituals, and explore the hypothesis that consciousness has a component that is shared. It will also provide important information about the power and impact of group rituals in terms of affecting emotions, experiences, beliefs, and behaviors. This could have scientific, health, and spiritual implications.



AIM #1. To use quantitative EEG to evaluate concomitant changes in the brains of multiple individuals performing the same group ritual.

AIM #2. To determine if individual brains begin to resonate with each other during group rituals.

AIM #3. To determine if the subjective effects of the group ritual experience correlates with changes in brain function.

DELIVERABLES: We anticipate 2-3 peer reviewed research articles, accompanied by press releases from Thomas Jefferson University.

Introduction

It has long been known that individual rituals such as meditation and prayer affect the brain in significant ways. EEG, fMRI, PET, and SPECT have all been used to evaluate the brain changes associated with individual practices. The results of these studies suggest a complex network of brain structures are involved including the frontal lobes related to concentration, the limbic system related to emotions, and the parietal lobe related to the sense of self. Depending on the practice, these structures, along with many others, demonstrate unique activity patterns that correlate with the subjective elements of the spiritual experience. Strong emotional reactions, in particular, are related to increased activity in the limbic system and the loss of the sense of self (i.e. self-transcendence) is associated with decreased activity in the parietal lobe.

Specific electrical patterns are also witnessed in the brain during practices associated with the experience of relaxed attention. Rhythmic rituals such as meditation, prayer, or music, cause related changes in the rhythmic electrical patterns in the brain. While there is a significant literature base regarding individual practices, there are no studies that have explored the impact of group rituals on the brain. While we would expect group rituals to have significant effects on the brain, an important aspect would be to determine if there is a resonance of brains between individuals engaged in group ritual. Thus, we would expect the same areas to have the same activity patterns when people are engaged in the same ritual practice. In addition, we would expect that the subject elements of the experience of group ritual correlate with the brain changes.

Approach

The proposed study will utilize EEG measurements of multiple individuals engaged in the same group rituals of drumming, chanting, dancing and meditation. We will use a wireless EEG system so that we can monitor 150 individuals simultaneously while they participate in a group ritual (i.e. 100 overall participants). We will randomly select 8-10 individuals out of the group for further tests that may be more intensive. These individuals must meet the inclusion criteria below:



Inclusion Criteria:

- ✚ Age greater than 18 years old.
- ✚ Must be generally healthy with stable medical conditions allowed.
- ✚ Stable doses of selected medicines are allowable according to the principal investigator.
- ✚ Must not have any neurological or psychiatric conditions.
- ✚ Women must not be pregnant.

The EEG will be performed using quantitative methods that will evaluate the frequencies and amplitudes of the electrical signals coming from each area of the brain. EEG recordings will begin before the group ritual starts and a resting baseline of 10 minutes will be recorded. The group ritual will then begin and will last approximately 90 minutes. Throughout this time, the EEG recording will be obtained on each of the selected subjects. At the conclusion of the ritual, another 10 minute resting EEG will be obtained. Group rituals will be performed over approximately 30 evenings, with approximately 150 subjects being evaluated per night. The number of subjects per session corresponds with Dunbar's number, a proposed cognitive limit to the number of people with whom one can maintain close social relationships. The total number of subjects will be approximately 4500. Quantitative EEG analysis will be performed on each subject individually as well as compared across individuals. In addition, questionnaires will be utilized to determine the pre and post-ritual emotional and spiritual state of the individuals. These will be correlated with the EEG findings.

Budget : \$500,000

\$250,000	EEG Systems
\$50,000	Principal Investigator, Dr. Newberg
\$50,000	EEG Specialist, Dr. Herring
\$50,000	EEG Analysis (post doc)
\$50,000	Musicians and Artist support staff
\$30,000	Nancy Wintering, Research Coordinator
\$20,000	Research Assistants

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