

Overview

The biofeedback study *Hemispheric and Autonomic Laterality: Effects of Unilateral Repetitive Activation*¹ was conducted at the Nova University Biofeedback Laboratories, under the guidance of noted biofeedback pioneer Dr. Joe Kamiya. The study involved 47 volunteer subjects, split between the experimental group watching a visual device, called the “Kinoscope”, (see picture and description below) and a control group.

The experimental group is referred to as the *Right Hemisphere Activation (RHA)* group. This group, in addition to watching the Kinoscope, also listened to meditative music. The control group, also referred to as the *Left Hemisphere Activation (LHA)* group, listened to spoken text while also seeing the text projected onto a screen. Several biofeedback measures were recorded one each subject during the sessions:

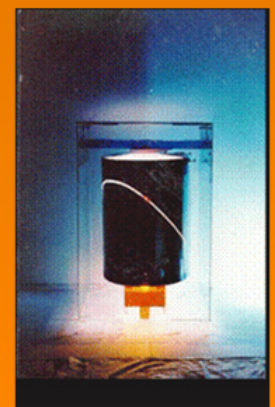
- Bilateral skin conductance level (**SCL**)
- Heart rate (**HR**)

Specifically, three hypotheses were tested:

- Individuals whose right hemispheres are being activated by the processing of repetitive spatial information should demonstrate shorter recovery following induced arousal than individuals whose left hemispheres are being activated by repetitive verbal information;
- Individuals whose left hemispheres have been repeatedly activated should score higher on post treatment verbal tasks
- Individuals whose right hemispheres have been repeatedly activated should score higher on post-treatment spatial tasks.

Each subject came to the laboratory three times a week for two weeks for a total of six sessions. **SCL** and **HR** were monitored for the entire 45 minutes of each session with time samples recorded every minute for each variable. The first 15 minutes of each session was a stabilization period. During sessions two, four, and six, three disruptions were randomly presented to elicit a startle response, allowing at least five minutes for recovery from each of nine disruptions. Visual startle consisted of turning on an overhead light; auditory startle was elicited by hitting a metal file cabinet with a hammer; and touch startle consisted of two taps on the right forearm by the experimenter. Time for recovery to baseline was noted in seconds.

The original Kinoscope used for Right Hemisphere Activation (RHA) was about 4 ft. high, by 3 feet wide and 3 feet deep. The rotating cylinder was controlled using a variable speed electric motor and voltage attenuator, capable of varying the rotation speed from 0 to up to 12 rotations per minute. The viewer saw a slow moving arc that rises and falls with the user-specified rotation speed. The speed is set to correlate with the music being played in the background.

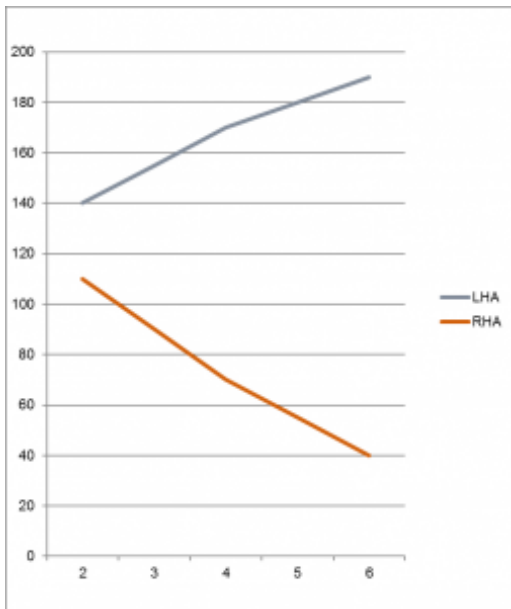


Results: The RHA Group Learned to Handle Stress Much More Effectively than the LHA Group

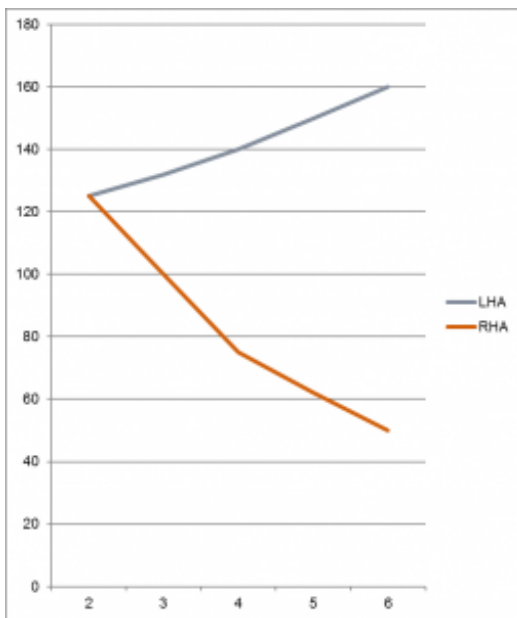
The resulting data was analyzed using various statistical techniques, and proved conclusive: the subjects watching the Kinoscope (the right hemisphere activation group) recovered from startle significantly faster than those in the control group. In other words, after exposure to the Kinoscope, the subjects in the RHA group were able to “relax” significantly more quickly than the LHA group.

The RHA group recovered significantly faster from startle than the left hemisphere activation (LHA) group, $F(3, 43) = 20.80, p < .001$ as determined by a MRM analysis (see Figures 1 and 2).

GROUP		LEFT SKIN CONDUCTANCE	RIGHT SKIN CONDUCTANCE	HEART BEAT
		LSCLR	RSCLR	HBR
RHA (N = 24)	Mean	70.5	82.6	55.8
	SD	82.5	84.5	31.5
LHA (N = 23)	Mean	166.5	163.6	91.9
	SD	75.4	75.5	37.3



Recovery time across sessions (LHA = left hemisphere activation group, N = 24, RHA = right hemisphere activation group, N = 23, LSCL = left skin conductance level; RSCL = right skin conductance level)



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Applications

The practical applications of this finding alone are fairly intuitive as many current diseases are considered to be stress related. The following list of stress related illnesses is taken from an article by By R. Morgan Griffin as a WebMD Feature, and was reviewed by Joseph Goldberg, MD:

- **Heart disease**
- **Asthma**
- **Obesity**
- **Diabetes**
- **Depression and anxiety**
- **Gastrointestinal problems**

- **Alzheimer's disease**
- **Accelerated aging**
- **Premature death**

Can We Learn to be More Creative?

Creativity is typically considered an attribute of the right brain hemisphere. Since the research cited strongly suggests an association between the activities of the the experimental group and right hemisphere activation, this begs the question, “Can we learn to be more creative?”

Creativity as measured by the *Torrance Tests of Creative Thinking* increased until 1990 in the United States. Thereafter scores have been declining. Kyung Hee Kim at the College of William & Mary discovered this in May, after analyzing almost 300,000 Torrance scores of children and adults. Kim found creativity scores had been steadily rising, just like IQ scores, until 1990. Since then, creativity scores have consistently inched downward. “It’s very clear, and the decrease is very significant,” Kim says. It is the scores of younger children in America—from kindergarten through sixth grade—for whom the decline is “most serious.”

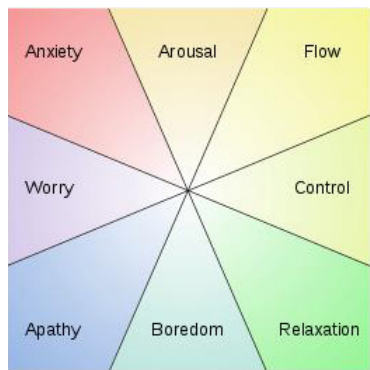
Renowned psychiatrist and writer Iain McGilchrist suggests that civilization, up to around the 16th century, maintained a reasonable balance between the left/right worlds. However, that balance has since slowly shifted towards the left hemisphere, leaving us with a modern-day sterile world devoid of interconnectedness, empathy, and a sense of “life”.

Could it be that this increasing emphasis on left-brain thinking has caused a decrease in our ability to be creative?

Henk J. Haarman’s research at the University of Maryland Center for Advanced Study of Language investigates the link between divergent thinking and the brain’s alpha waves. He has found that students who showed higher alpha activity in between solution attempts were more successful at problem solving.

“This wave type has been used as a universal sign of relaxation during meditation and other types of rest,” comments Professor Øyvind Ellingsen, who studies the effect of alpha waves at the Norwegian University of Science and Technology. “The amount of alpha waves increases when the brain relaxes from intentional, goal-oriented tasks. This is a sign of deep relaxation, — but it does not mean that the mind is void. This default activity of the brain is often underestimated. It probably represents a kind of mental processing that connects various experiences and emotional residues, puts them into perspective.”

Brainwave researcher Kelly Howell suggests that: “Relaxation enables us to go inward, to allow our unconscious minds to uncover creative solutions our conscious minds might not recognize. Dreams have inspired Einstein and Physicist Nils Bohr, Coleridge’s poem *Kubla Khan*, and others including Paul McCartney, Edgar Allen Poe, Robert Louis Stevenson and Steven King.”



Mental state in terms of challenge level and skill level, according to Csikszentmihalyi’s flow model.

In a recent large review, Rex Jung and colleagues provide a “first approximation” regarding how creative cognition might map on to the human brain. Their review suggests that when you want to loosen your associations, allow your mind to roam free, imagine new possibilities, and silence the inner critic, it’s good to reduce activation of the Executive Attention Network (a bit, but not completely) and increase activation of the Imagination and Salience Networks. Indeed, recent research on jazz musicians and rappers engaging in creative improvisation suggests that’s precisely what is happening in the brain while in a flow state.

Unfortunately the study *Hemispheric and Autonomic Laterality: Effects of Unilateral Repetitive Activation* didn’t measure brain wave activity during the experiment. However, we suspect that the RHA group would have exhibited an increase in alpha wave (characteristic of wakeful rest) activity. We do know, at the very least, that the RHA group exhibited a statistically validated “relaxation response” which seems to be an important part of the overall creative process.

Can We Learn to be More Empathetic?

Empathy is typically considered an attribute of the right brain hemisphere. Since the research cited strongly suggests an association between the activities of the the experimental group and right hemisphere activation, this begs the question, “Can we learn to be more empathetic?”

Few would disagree that the human race could stand a huge boost in its ability to empathize. Renowned psychiatrist and writer Iain McGilchrist states that “the right hemisphere yields a world of individual, changing, evolving, interconnected, implicit, incarnate, living beings in the context of the lived world”, and characterizes the left hemisphere as lifeless, static, fixed and isolated. With more empathy, we could well see a reduction in wars, a reduction in civil rights violations, more awareness of our earth’s environment, more humanitarian aid to those in need, and less economic inequality.

Recent research conducted at Emory University and subsequently published in the journal *Social Cognitive and Affective Neuroscience*, showed that a meditation program called Cognitively-Based Compassion Training was able to improve people’s ability to read emotional expressions on others’ faces.

So, perhaps empathy can in fact be “activated”?

The idea of “activating” empathy through right brain stimulation was beyond the scope of the study I have been referencing. But perhaps it isn’t too much of a stretch to suggest that by “exercising” the right brain, as we did with the RHA group, attributes of the right brain hemisphere can in fact be enhanced and/or strengthened.