Physiological Reactivity in the Family: Triangles, Anxiety & Differentiation of Self

Victoria Harrison, LMFT, LCSW
“...human behavior is part of all nature, so that it is as knowable and predictable and reproducible as other phenomena in nature. I believe that research should be directed at making theoretical contact with other fields, rather than applying the scientific method to subjective human data.”

Murray Bowen, 340
“Man is viewed as an evolutionary assemblage of cells who has arrived at his present state through hundreds of millions of years of evolutionary adaptation and maladaptation and who is evolving toward other changes. In this sense, man is related to all living matter. Man differs from other animals in the size of his brain and the ability to think and reason.”

Murray Bowen, Family Therapy in Clinical Practice, page 135
It takes a special effort.

Learning & Using Bowen theory as the framework for:
Observations in one’s own family
Extensive reading in evolution & natural sciences
Clinical Practice and Research using biofeedback & neurofeedback
“The odyssey (toward a science of human behavior) required a comprehensive theory that could preside over all of the variables.” (Murray Bowen, from “An Odyssey Toward Science” in Family Evaluation by Michael Kerr.)
In what ways are Togetherness, Individuality, Differentiation of Self, and Anxiety built into our brains & our biology?
Neuroscience

Is the intersection of various fields without an overarching theoretical framework nor research that correlates across diverse measures.

- Neuroanatomy
- Neurochemistry & pharmacology
- Electrical Measures EEG
- Oxygen/blood flow measures
- Neuronal measures: molecular
- Biofeedback & Neurofeedback
Paul MacLean. The Triune Brain
J.P. Henry

Stress, Health & the Social Environment

Reactions in the Service of Relationship Stability
Reactions in the Service of Individual Survival

Limbic cortex
Hypothalamus
Cerebellum
Neurotransmitters (dopamine, norepinephrine and serotonin)
Experiences the reactivity of others as one’s own

Navigates in the relationship system automatically

Senses the relationship realities

The Eternal Now

Experiences life as a separate self

On the clock

Weighs self interest

Can put words to experience & perception

Math & Calculation
• “...the right hemisphere was more active when he recognized others but his left hemisphere was most active when he saw himself.” page 96

• “One reason the sense of self can be so fragile may be that the human mind is continually trying to get inside the minds of other people.” 95

• “The medial prefrontal cortex ...is continuously stitching together a sense of who we are.” 96

“The Neurobiology of the Self”
Carl Zimmer
Scientific American, November 2005
“The medial prefrontal cortex becomes more active at rest than during many other kinds of thinking.”

Dr. Debra A. Gusnard
Washington University
The Polyvagal Theory

Steve Porges, PhD
Director of Brain-Body Center, U of Illinois in Chicago
Theory of Dissolution

“The higher nervous system arrangements inhibit (or control) the lower, and thus, when the higher are suddenly rendered functionless, the lower rise in activity.”

–John Hughlings Jackson (1835-1911)
Father of English Neurology
Quoted by Stephen Porges 11/01

New Vagal
Attunement to facial expression & eye contact linking to gut & heart via vagal tract

SNS/HPA Reactivity
Fight/Flight/Befriend
Alarm/Fear
Adrenalin, Catecholamines & Cortisol

Old Vagal Reactivity
Freeze, Shut Down,
Play dead, Disassociation,
Sleep
Cerebral Cortex: senses: smell, hearing, sight, taste, touch.

Limbic System: SNS/PNS/HPA Reactivity to Relationships, fight, flee, freeze, befriend, sexual, stress reactions,

Prefrontal Cortex: intellect, language, math, prayer, music, reflection, ability to study something, learn new behaviors

Anterior Cingulate Gyrus: Awareness of Self/Feelings arise

Von Economo neurons (spindle cells)

Brain Stem: Survival, energy metabolism, wake-sleep, digestion, heart rate, vagal activity
“The Mirror Neuron System”
Giacomo Rizzolatti & others

Annual Review of Neuroscience
Vol. 27, July 2004, 169-192
The Nervous Systems
Changing hormone levels during the menstrual cycle.
Founding Chairman and Professor of Department of Reproductive Medicine and Biology at University of Texas Medical School at Texas Medical Center in 1971 and in 1983 established and directed Texas Institute of Reproductive Medicine and Endocrinology.

Hosted my sabbatical in 1985, was teacher and mentor, and with his wife Dr. Anna Steinberger, collaborated on the study of ovulation and reactivity.
In what ways do Relationships between kin & kind Regulate Our brains, biology & behavior?
“The relationship process is basic to adaptation of life, and reactivity to relationships is built into the biology and behavior or all species.

…Relationships and reactivity to these relationships is absolutely fundamental to biological systems.”

Pioneer research on Menstrual Synchrony between Women in the 1970’s.

Social Regulation of Reproduction in Primates and Humans

For
CSNSF Facts of Life Conference: 2004

Relationships in the Family or Group

Physiology

Neuroendocrine

Social/Sexual Behavior

Reproduction

Toni Ziegler, PhD
Senior Scientist,
National Primate Research Center
University of Wisconsin-Madison

http://ink.primate.wisc.edu/~ziegler/
Human biology is organized to allocate energy for

- **Individual Metabolism**
  
  Growth, Healing, Digestion, Etc.

- **Relationships**
  
  Family of Origin
  Spouse(s)
  Reproduction & Offspring

- **Brain Development**

Adapted from study of Bioenergetics which focuses on the individual & energy sources & consumption
Five Fingers of Fitness

- Survival of individual
- Stability of family
- Mate or marriage
- Reproduction/rearing children who rear child
- Exercising the brain
Measures of Reactivity and Anxiety

**EEG: Electrical Activity**

- Prefrontal Cortical Activity: 16 Hz +
- Intellect/Emotion Connect: 14 Hz
- Emotional Reactivity Limbic: 6 – 12 Hz
- Emotional Reactivity Brain Stem: 2-6 Hz
- Vagal Component of ANS

**Biofeedback:**

- **EMG: Skeletal Muscle Activity**
- **DST: Vasoconstriction due to ^ SNS activity that cools fingertip temperature to V 90 F**
- **(^ catecholamine) or ^95 due to inflammatory process & vagal overactivity**
- **EDR: ^ skin sweat response measured in mohms of electrical activity at palm (adrenal activity)**
EEG Measure & Levels of Differentiation of Self

- Dominant 2 – 8hz EEG indicates
  - Greater effort required to manage self in relationships
  - Greater reactivity to relationships
  - Greater degrees of emotional fusion

Associated with a variety of physiological reactions and symptoms.
EEG Measures & Levels of Differentiation of Self

• Lower 14hz EEG indicates
  -- Lack of access to intellect & prefrontal cortex for self-awareness & self-regulation
  -- Decreased “top down” influence over emotional reactivity
  -- Increased fusion of emotional reactivity & intellectual activity
Research Project

The Study of Physiological Reactivity in the Family at Higher and Lower Levels of Differentiation of Self
“Biochemistry of people in an intense relationship will have complementary & reciprocal relationships with each other. Chemistry will come to be reciprocal or complementary in relation to each other.”

Murray Bowen from “Bowen Theory & Therapy: An Overview” Videotape 1 Bowen – Kerr Interview Series
“The human family is an emotional unit that regulates individual biology and behavior.”

Victoria Harrison, “A Better Chance”
“An emotional system is composed of a series of interlocking triangles. ... A two person system is an unstable system that immediately forms a series of interlocking triangles. The triangle has definite relationship patterns that predictably repeat in periods of stress and calm.”

Murray Bowen, Page 199

“There are two important variables in triangles. One deals with the level of ‘differentiation of self.’ The other variable deals with the level of anxiety or emotional tension in the system. The higher the anxiety, the more intense the automatic triangling in the system. The lower the level of differentiation in the involved people, the more intense the triangling. The higher the level of differentiation, the more the people have control over the emotional process.”

Murray Bowen, Page 307
“There are varying degrees of fusion between emotional and intellectual systems in the human. The greater the fusion between emotion and intellect, the more the individual is fused into people around him. The greater the fusion, the more man is vulnerable to physical illness, emotional illness, and the less he is able to consciously control his own life.”

Murray Bowen 305
Hypothesis: At Lower Levels of DOS

- Individuals operate more as extension of each other: react with; to; and for each other more of the time physiologically
- Higher level of anxiety reactions for everyone more chronic & ever-present
- Less regulation of self/ More reliance on others, on relationships
- Symptoms occur based upon patterns of reactivity operating in triangles
Hypothesis: At higher levels of DOS

- Greater separateness or independence is evident in physiological reactivity
- Less chronic & ever present anxiety reactions
- Individuals interrupt the transmission of anxiety in many ways.
- There is greater regulation of self.
- Fewer & less severe symptoms
Research Protocol

Mother & Child Talk to Each Other about Self & the Other for 3 minutes
Pause for 1 minute

Father & Child Talk to Each Other about Self & the Other for 3 minutes
Pause for 1 minute

Mother & Father Talk to Each Other about Self & the Other for 3 minutes
Pause for 1 minute

During simultaneous measures of EMG, DST, EDR, and Brain Waves
Measures of Reactivity and Anxiety

**EEG: Electrical Activity**
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  Vagal Component of ANS

**Biofeedback:**
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- 4-8 mV Active but At Ease
  ^8 mv Tense v2 mv Relaxed
- 93-95 degrees F Active but At Ease
  v90 degrees SNS arousal
  ^95 degrees Inflammatory Process
- 2 – 4 mohs Active but At Ease
  v2 mohs & flat: Exhaustion
  ^4 mohs Tense
Data Generated for Each Triangle
3 for each parent + 1 for each child = 9 sets of

✓ 12 Minutes of EEG from 2 Hz – 44Hz Spectrum display for each triangle
✓ 12 Minutes of 14 Hz EEG measured & stored in .002 increments of a minute = 542 measures/minute (graphed in a manual selection process)
✓ 12 minutes of EMG in mv measured & stored in .002 increments of a minute = 542 measures/minute (graphed in a manual selection process)
✓ 12 minutes of DST in degrees f in .002/minute increments = about 110 measures/minute
✓ 12 minutes of EDR in mohs in .002/minute increments = about 110 measures/minute
✓ Audiotape recording of 3 minute interaction segments
Organization of Data
By Individual and By Triangle

- Average of EMG, DST, EDR for each person over 12 minutes
- Average of EMG, DST, EDR for each person in 3 Minute Segments, according to M&C, F&C, M&F interacting
- Average of Total EMG, DST, EDR per triangle
- Comparison of Individuals (Mother to Father to Child and Child#1, Child#2 and Child#3 to each other)
- Line graph of simultaneous measures for each triangle with 3 Minutes of M&C, F&C, and M&F designated
- Videotape of accelerated EEG spectrum
- Audiotape recording of interaction segments
Sibling Physiology

Average EMG for Each Child

Average DST for Each Child

Average EDR for Each Child
Triangle # 1
Mother and Father and Adult Child #1

6.42 EMG 91.94 DST 11.62 EDR
13.92 EMG 90.07 DST 8.94 EDR
4.32 EMG 92.10 DST 10.86 EDR
11.28 EMG 86.27 DST 9.05 EDR
11.62 EMG 91.94 DST 11.62 EDR

13.53 EMG 92.24 DST 8.24 EDR
6.60 EMG 87.18 DST EDR 7.67
6.51 EMG 89.45 DST 5.56 EDR

12.43 EMG 92.5 DST 14.33 EDR
17.94 EMG 91.95 DST 8.06 EDR

11.28 EMG 86.27 DST 9.05 EDR

Physiological Reactivity & Anxiety in Triangle #1: Mother-Father-Child #1

Anxious Physiology highest while interacting with each other

Marital Distance

Anxiety lower while interacting w/son
Anxiety higher while observing son & mother.

Anxiety higher interacting with son than watching son and father.

Child Focus

Anxiety lower while interacting w/son
Anxiety higher while observing son & mother.

Anxiety higher interacting with mother

Distance

Anxious Physiology V/s while observing parents interacting
Family Physiology: Triangle 1

Triangle #1 EMG

12 Minutes

MV of Skeletal Muscle Activity

M EMG
F EMG
C#1 EMG
Family Physiology: Triangle 1

Triangle #1 DST

Degree of Skin Temperature

12 Minutes

M Temp
F Temp
Child#1Temp
Family Physiology: Triangle 1
Triangle # 2
Mother and Father and Adult Child #2

6.24 EMG 92.80 DST 8.69
24.16 EMG 92.36 DST 11.52 EDR
14.55 EMG 93.34 DST 15.35 EDR

20.36 EMG 90.49 DST 9.45 EDR
21.94 EMG 90.36 DST 8.31 EDR
18.08 EMG 96.18 DST 8.48 EDR

7.72 EMG 93.19 DST 11.88 EDR
21.53 EMG 95.57 DST 10.08 EDR
19.75 EMG 91.71 DST 7.74 EDR

9.45 EDR
11.88 EDR
8.31 EDR
Physiological Reactivity & Anxiety in Triangle # 2: Mother-Father-Child #2

Anxious Physiology highest while interacting with each other

Marital Distance

Child Focus

Anxiety ^ interacting with daughter & slightly lower observing mother & daughter

Anxiety ^ interacting w/father

Sx

Only slight V in anxiety while observing interaction of parents

Slight V in anxiety watching Anxiety ^ interacting w/daughter

Anxiety ^ interacting w/mother
Family Physiology: Triangle 2
Triangle #2 Temperature

Family Physiology: Triangle 2
Family Physiology: Triangle 2
Triangle #3
Mother and Father and Adult Child #3

- 7.31 EMG 92.5 DST 19.51 EDR
- 13.83 EMG 88.36 DST 16.67 EDR
- 14.18 EMG 92.76 DST 18.58 EDR
- 10.79 EMG 92.43 DST 8.65 EDR

- 18.52 EMG 90.56 DST 13.79 EDR
- 5.37 EMG 92.08 DST 17.33 EDR
- 13.83 EMG 88.36 DST 16.67 EDR
- 18.91 EMG 89.66 DST 13.52 EDR

- 12.63 EMG 91.84 DST 13.53 EDR
- 12.76 EMG 89.49 DST 16.67 EDR
- 10.79 EMG 92.43 DST 8.65 EDR
- 18.91 EMG 89.66 DST 13.52 EDR
Physiological Reactivity & Anxiety in Triangle #3: Mother-Father-Child #3

Anxious Physiology highest while interacting with each other

Marital Distance

Child Focus

Anxiety ↑ observing mother & daughter interacting
Anxiety V interacting w/dgt

Very slight V in anxiety while interacting w/father

Anxious Physiology V/s while observing parents interacting

Anxiety ↑ interacting w/daughter
Very slight V in anxiety observing father & daughter

Anxiety ↑ interacting w/mother
Family Physiology: Triangle 3
Family Physiology: Triangle 3
Family Physiology: Triangle 3
No physical/psy Sx
MA $$ self-sufficient
Most distant from family
“Loner” with older male lover
Surrogate father of daughter
By lesbian couple

Severe chronic GI Sx + Endo
Depression  Far more dep. On family
BA in Education  wants to teach
Poor grades  No physical Sx

Jr. in high school
Drinking too much
Plans to marry man unemployed
Poor functioning boyfriends

Living Together 1980

1980

1982

endometriosis

1985

1987
Clinical Implications of Research:
More accurate understanding of symptom development & of changes that occur through work on Differentiation of Self

- Physiology in individual a product of reactivity in emotional triangles
- Increased regulation of anxiety within self by any one family member interrupts transmission of anxiety in many ways.
- Less chronic & ever present anxiety reactions for all
- Fewer & less severe symptoms
- Greater separateness or independence is evident
“There are varying degrees of fusion between emotional and intellectual systems in the human. The greater the fusion between emotion and intellect, the more the individual is fused into people around him. The greater the fusion, the more man is vulnerable to physical illness, emotional illness, and the less he is able to consciously control his own life.” Murray Bowen, FTCP, 305

“It is possible for man to discriminate between the emotions and the intellect and to slowly gain more conscious control of emotional functioning.” Murray Bowen, page 105

“Any effort toward assuming responsibility for one’s own distress, toward containing one’s own needs a little better, toward blaming the other less, or toward controlling one’s emotional responsiveness to the other is a step toward (differentiation of self).” Murray Bowen, 234
Marital Distance
+ Marital Conflict
+ Marital Fun

Child Focus
Clinical Implications of Research:
Work on Differentiation of Self
“There is some evidence that the human can actually determine the function of his own emotional system through the control of his own emotionality. ... It leads me to believe human behavior will become a science by the middle of the next century. The human will be richer if the favorable trend continues.”

Victoria Harrison

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