

# Absorption, Daydreaming, and Meditation

Fall 2014

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## States of Altered Attention

- “Everyday” States
  - Absorption and Flow
  - Daydreaming and Mind-Wandering
- “Exotic” States
  - Meditation and Mystical Experiences
    - Yoga, Transcendental Meditation
    - Zen, Mindfulness Meditation

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## Absorption

Tellegen & Atkinson (1974); Tellegen (1987)

- Cognitive Restructuring of Self and Ego Boundaries
  - Narrowed or Focused Attention
  - Departure from Everyday Modes of Thought
- Content Analysis
  - Responsiveness to Engaging or “Inductive” Stimuli
  - Vivid, Suggestive Images; Imagistic Thought
  - Cross-Modal Experiences (e.g., Synesthesia)
  - Absorption in Thoughts and Imaginings
  - Vivid Re-Experiencing of the Past
  - Episodes of Expanded Awareness
  - Experiences of Altered Consciousness

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**Aspects of Absorption**  
Tellegen (1982)

- Responsiveness to Engaging Stimuli
  - I can be deeply moved by a sunset
- Synesthesia
  - Some music reminds me of pictures or changing color patterns
- Enhanced Cognition
  - I can often somehow sense the presence of another person before I actually see or hear her/him
- Obliviousness/Dissociative Involvement
  - While watching a movie, a TV show, or a play, I may become so involved that I may forget about myself and my surroundings and experience the movie as if it were real and as if I were taking part in it
- Vivid Reminiscence
  - Sometimes I feel and experience things as I did when I was a child
- Enhanced Awareness
  - Things that might seem meaningless to others often make sense to me<sub>4</sub>

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**Absorption and the  
“Big Five” Structure of Personality**  
NEO Personality Inventory (Costa & McCrae, 1985, 1992)

- Neuroticism, Extraversion
- Agreeableness, Conscientiousness
- Openness to Experience
  - Richness of Fantasy Life
  - Aesthetic Sensitivity
  - Awareness of Inner Feelings
  - Need for Variety in Actions
  - Intellectual Curiosity
  - Liberal Value System

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**An Expanded Concept of Openness**  
Correlations with Hypnotizability  
Glisky & Kihlstrom (1993)

- Absorption,  $r = .15$ 
  - Absorption
  - Fantasy, Aesthetic Sensitivity, Feelings
- Socio-Political Liberalism,  $r = .03$ 
  - Intellectual Curiosity
  - Openness to Unusual Ideas, Variety in Thought and Action, Liberal Values
- Intellectance,  $r = .05$ 
  - Inquiring Intellect, Culturedness

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## Imaginative Involvements

J. Hilgard (1970)

- Reading
- Drama
  - The Method vs. Technical Acting
- Sensory Stimulation
  - Nature
  - Art, Music
  - Direct Sensory Experience
- Adventure
  - Physical vs. Mental “Space Travelers”

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## The Book-Reading Fantasy

Shor (1970)

- Vivid Imagination
  - Equivalent to Living the Experience Itself
  - Fantasy Totally Compelling
    - Visual
      - Color
      - 3 Dimensions
    - All Modalities of Imagery
- Oblivious to True Reality
- Unaware of Active Imagination
- Alert to Important Events
  - But at Nonconscious Level

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## Involved Readers

J. Hilgard (1970)

- Two Types of Book-Reading Fantasy
  - Character Identification
  - Empathic Identification
- Characteristics of Involved Readers
  - Influenced by Power of Words
  - Not Passive; Actively Open to Influence
  - Pleasure in Experience
  - Vivid Imagery (Especially Visual)
  - Suspend Critical Processes
  - Time-Limited

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## Reading as Consciousness Change

Nell (1988)

- Aspects of Reading for Pleasure
  - “World-Creating Power of Books”
  - “The Reader’s Effortless Absorption”
- Components of *Ludic Reading*
  - Playful; Stands Outside Ordinary Life
  - Absorbs Player/Reader Completely
  - Unproductive
  - Circumscribed by Space and Time
- Fiction, Narrative Nonfiction
  - 1+ Books / Week



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## “The Method” in Acting

Stanislavski (1863-1938)

When an actor is completely absorbed by some profoundly moving objective, so that he throws his whole being passionately into its execution, he reaches a state that we call inspiration. In it almost everything he does is subconscious and he has no conscious realization of how he accomplishes his purpose.



*An Actor Prepares* (1936)  
*An Actor's Work* (1938)

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## Flow

Csikszentmihalyi & Csikszentmihalyi (1988); Csikszentmihalyi (1990)

- A state in which people are so involved in an activity that nothing else seems to matter;
- The experience itself so enjoyable that people will do it even at great cost, for the sheer sake of doing it.



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## Flow

Csikszentmihalyi & Csikszentmihalyi (1988); Csikszentmihalyi (1990)

- Flow (Optimal Experience)
  - Focused and Ordered State of Consciousness
  - Equivalent Ratio of Skills to Challenges
  - Contents of Consciousness Congruent with Goals
  - Mental Energy Flows Effortlessly
- Contrast with *Psychic Entropy*
  - Information Conflicts with Existing Intentions
    - Prevents Their Execution

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## Flow as a “Peak Experience”

Maslow (1954, 1968)

- Achieving Unique Inner Potential
- B[eing]-Values
  - Wholeness, Perfection
  - Completion, Justice
  - Aliveness, Richness
  - Simplicity, Beauty
  - Goodness, Uniqueness
  - Truth, Self-Sufficiency
  - Effortlessness, Playfulness



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## The Peak Experience

Maslow (1959)

- “The experience or the object tends to be seen as a whole, as a complete unit, detached from relations, from possible usefulness, from expedience and from purpose”
- “The percept is exclusively and fully attended to”
- Perception can be relatively ego-transcending, self-forgetful, egoless”
- “Disorientation in time and space”
- “Unity of consciousness”

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## Sampling the Peak Experience

Maslow (1959)

I would like you to think of the most wonderful experience or experiences of your life; happiest moments, ecstatic moments, moments of rapture, perhaps from being in love, or from listening to music or suddenly "being hit" by a book or a painting, or from some great creative moment.

First list these.

And then try to tell me how you feel in such acute moments, how you feel *differently* from the way you feel at other times, how you are at the moment a different person in some ways.

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## "Unity of Consciousness"

Maslow (1968)

In some reports... the whole of the world is seen as unity, as a single rich live entity.

In other of the peak experiences, most particularly the love experience and the aesthetic experience, one small part of the world is perceived as if it were for the moment all of the world.

In both cases the perception is of unity.

Probably the fact that the B[eing]-cognition of a painting or a person or a theory retains all the attributes of the whole of Being, i.e., the B[eing]-values, derives from this fact of perceiving it as if it were all that existed at that moment.

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## Aspects of Daydreaming

Rational Scales of the Imaginal Processes Inventory  
Singer & Antrobus (1970)



- Daydreaming Frequency
- Nightdreaming Frequency
- Absorption in Daydreaming
- Acceptance of Daydreaming
- Positive Reactions to Daydreaming
- Frightened Reactions to Daydreaming
- Visual Imagery in Daydreams
- Auditory Imagery in Daydreams
- Problem Solving Daydreams
- Present Orientation in Daydreams
- Future Orientation in Daydreams
- Past Orientation in Daydreams
- Bizarre-Improbable Daydreams
- Mindwandering
- Achievement-Oriented Daydreams
- Hallucinatory-Vividness of Daydreams
- Fear of Failure Daydreams
- Hostile Daydreams
- Sexual Daydreams
- Heroic Daydreams
- Guilt Daydreams
- Interpersonal Curiosity
- Impersonal-Mechanical Curiosity
- Boredom Susceptibility
- Mentation Rate
- Distractibility
- Need for External Stimulation
- Self-Revelation

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## Dimensions of Daydreaming

Short Imaginal Processes Inventory  
Huba, Singer, Aneshensel, & Antrobus (1982)

- **Positive-Constructive Daydreaming**
  - A really original idea can sometimes develop from a really fantastic daydream.
  - My fantasies usually provide me with pleasant thoughts.
- **Guilt and Fear-of-Failure Daydreaming**
  - In my fantasies, a friend discovers I have lied.
  - I imagine myself failing those I love.
- **Poor Attentional Control**
  - I am the kind of person whose thoughts often wander.
  - I find that I easily lose interest in things that I have to do.

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## Daydreaming and Information Processing

Antrobus (1968)

- **Vigilance Task (2 hours)**
  - Press Specific Button to Specific Tone
    - Monetary Incentive for Hits
- **Information Load**
  - Rate of Presentation
    - 1 tone / 5, 1, or 0.5 Seconds
  - Number of Tones
    - 1, 2, or 3 Tones
- **Thought-Sampling (Every 15 Seconds)**
  - Stimulus-Independent Mentation
    - Task-Unrelated Intrusive Thoughts (TUITs)

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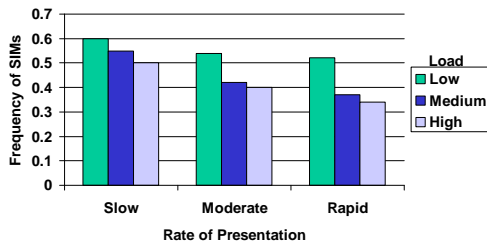
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## Stimulus-Independent Mentation

Antrobus (1968)



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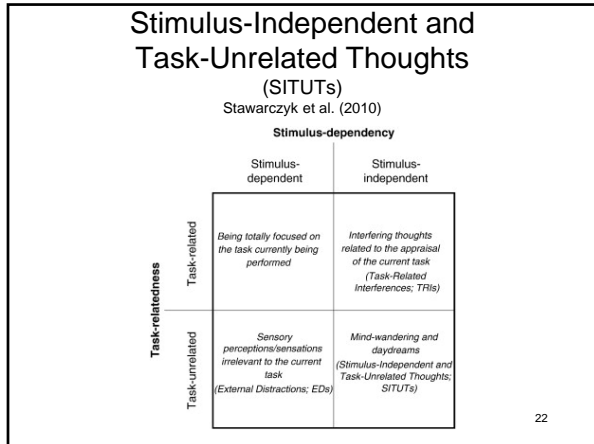
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### Absent-Mindedness

Cognitive Failures Questionnaire  
Broadbent et al. (1982); Rast et al. (2008)



- **Forgetfulness**
  - Of Knowledge or Plans
    - Do you find you forget people's names?
- **Distractibility**
  - Especially in Social Situations
    - Do you find yourself suddenly wondering whether you've used a word correctly?
- **False Triggering**
  - Interrupted Processing of Cognitive/Motor Activities
    - Do you find you forget why you went from one part of the house to the other?

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### “Zoning Out” During Reading

Schooler et al. (2005)

- Read Attention-Demanding Text
- Assessments of Mind-Wandering
  - Self-Caught
  - Probe-Caught
- Subjects Often Unaware of Mind-Wandering
  - Especially When Caught by Probe

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## The Paradox of Mind-Wandering

Schooler (2002); Schooler et al. (2005); Smallwood & Schooler (2006)

- Not Just “Zoning Out”
  - Attention Decoupled from Primary Task
    - Control Shifted from Primary Task to Personal Goals
  - Decreases During Controlled Processing
    - Consumes Attentional Resources
  - Increases with Practice and Skill
    - More Resources Available
- Unconscious
  - No Conscious Intention to Shift
  - No Conscious Awareness that Shift Occurred

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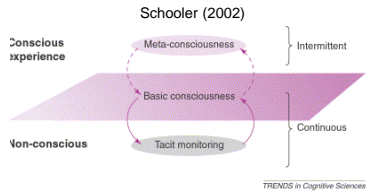
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## Consciousness and Meta-Consciousness



- “Basic Consciousness”
  - Perceptions, Feelings, etc.
- Meta-Consciousness
  - Explicit, Reflective Awareness of Contents of Consciousness
- Tacit Monitoring
  - Checks Consciousness for Goal Failures, Unwanted Thoughts, etc.

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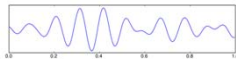


## Two Views of Brain Function

Raichle (2010a, 2010b)



- Sherrington (1906): Brain as Reflex
  - Activated by Environmental Stimuli
  - Implicit in Functional Neuroimaging
    - Collect Activations by Stimuli or Tasks
    - “Subtract Out” Baseline Activity
- Berger (1929): Brain in Constant Activity
  - EEG is Active Even When Subjects Are At Rest
    - Alpha Activity as “Berger Rhythm”



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## Two Modes of Brain Activity

Raichle (2001, 2010)



- The Brain is Intrinsically Active
  - Invalid *Assumption of Pure Insertion*
  - Some Regions Active During Control Task
    - Eyes-Closed Rest / Maintain Visual Fixation
  - *Deactivated* by Goal-Directed Task
- Two Modes of Brain Activity
  - Task-Positive
    - Active Task-Engagement, Undistracted Focus
  - Task-Negative
    - Not Otherwise Engaged: Mind-Wandering/Daydreaming

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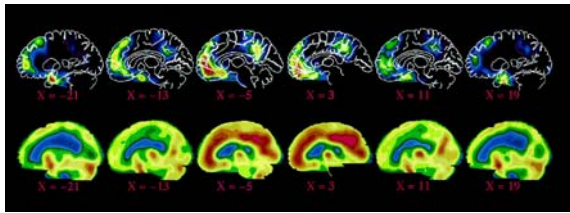
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## The Default-Mode Network in the Brain

“Task-Negative” Network

Raichle et al. (2001)

Medial Temporal Lobe                      Medial Parietal Cortex  
 Medial Prefrontal Cortex                  Lateral Parietal Cortex  
 Posterior Cingulate Cortex                Inferior Parietal Cortex  
 Decreased Activity During Attention-Demanding Tasks



Increased Activity While Awake, Eyes Closed, Resting Quietly 29

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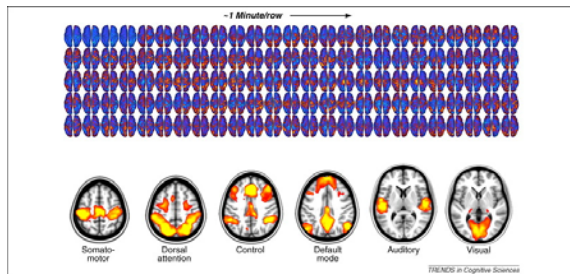
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## The Default Mode Network in Action

Raichle (2010)



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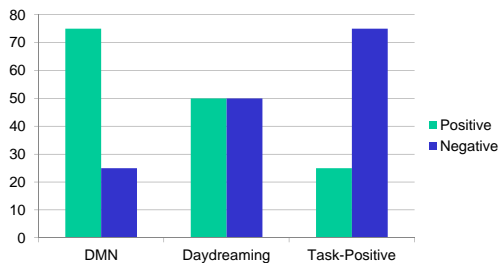
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## Identifying the *True* Default Mode Network

Appropriate Control:  
Thinking About *Nothing At All*



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## Eastern Meditative Traditions

Doniger, *Encyclopedia of World Religions* (1999)

- Raja Yoga
  - Based on Hindu Philosophy of *Samkhya*
  - Goal of *Samadhi*, or *Total Self-Collectedness*
    - Abolishes Distinction Between Meditator, Object
- Zazen
  - Based on Buddhism
  - Goal of *Nirvana*, or Enlightenment
    - Extinction of Desire, Individual Consciousness



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## Introduction to America

World Parliament of Religions  
World's Columbian Exposition  
Chicago, 1893



- Yoga: Swami Vivekananda
- Zen: Soen Shaku

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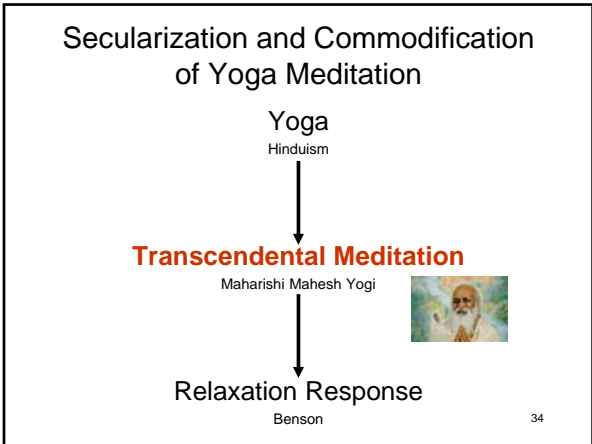
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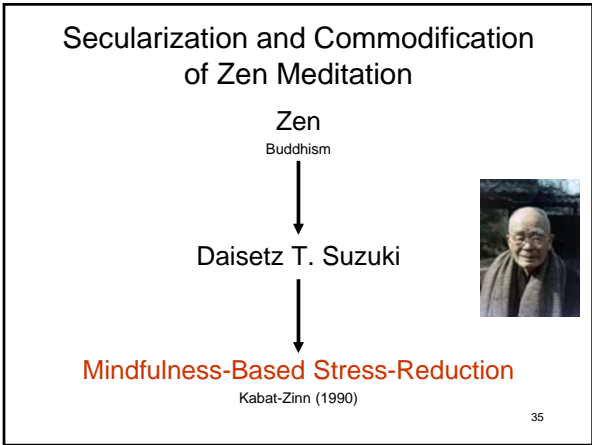
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- ### Three Kinds of Meditation?
- Lutz et al. (2008) 
- “One-Point” Meditation (Zen)
    - Focused Attention
      - Sustained Attention on Selected Object
    - Open Monitoring
      - No Focus on Object
  - “Compassion” Meditation (Tibetan)
    - Contemplation of Suffering in World
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## Characteristics of Meditative Practices

Deikman (1966)



- Contemplation
  - Nonanalytic Apprehension
    - Banish Discursive Thought
    - Empty Mind of All but Percept
  - Thought as Interference
    - Essential Knowledge Obtained through Perception

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## Active vs. Full Contemplation

Deikman (1966)



- Active Contemplation (Initial Phase)
  - Exclude and Devalue Inner and Outer Stimuli
  - Concentration, Breathing Exercises as Diversions
- Full Contemplation (Final Phase)
  - Automatization of Contemplation
    - Contemplative Mode is Autonomous
  - Passivity, Surrender

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## Modes of Experience

Deikman (1966)



- | <u>Action Mode</u>                   | <u>Receptive Mode</u>               |
|--------------------------------------|-------------------------------------|
| • Active Manipulation of Environment | • Passive Experience of Environment |
| • Increased Muscle Tension           | • Decreased Muscle Tension          |
| • Focalized Attention                | • Diffuse Attention                 |
| • Logical Thought                    | • "Alogical" Thought                |
| • Firm Ego Boundaries                | • Self Merged with Objects          |

Shift from *Doing Things* to *Letting Things Be*

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## Features of Mystical Experience

Deikman (1966)



- Reality Transfer
  - Thoughts and Images Become Real
- Sensory Translation
  - Mental Processes Experienced as Physical Sensations
    - Heightened Attention
    - Absence of Analytic Thought
    - Receptive Attitude

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## Features of Mystical Experience

Deikman (1966)

- Unity Between Self and Object
  - Perception of Psychic Structure
  - Perception of Real Structure
    - Perceptual Expansion
- Ineffability
  - Primitive, Pre-Verbal?
  - Complexity
  - Trans-Sensate Phenomena
    - Experience Beyond Sensation, Memory, Thought

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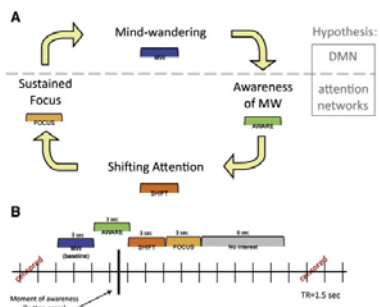
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## Meditation and Daydreaming

Hasenkamp et al. (2012)



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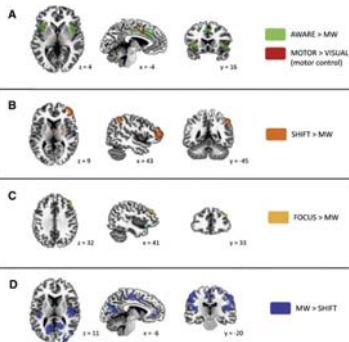
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## Brain Activation During Meditation

Hasekamp et al. (2012)



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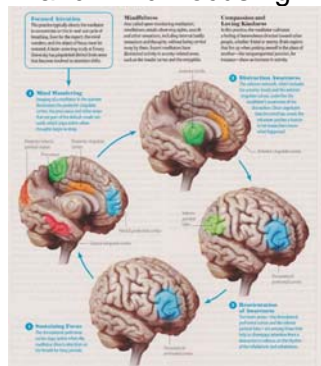
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## The Cycle of Mind-Wandering and Mind-Focusing



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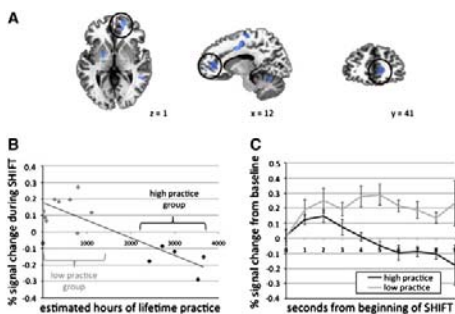
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## Effects of Meditation Practice

Hasekamp et al. (2012)



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## De-Automatization

Deikman (1966)



- Reorganization of Interpretive Events
- Automatic Schemata
  - Adaptive
  - Limits
- Looking at Self and World in New Ways

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## Automaticity Defined

LaBerge (1975); Posner & Snyder (1975); Schneider & Shiffrin (1977)

- Inevitable Evocation
- Incurable Completion
- Effortless Execution
- Parallel Processing
- Unconscious
- Innate vs. Acquired
  - Proceduralization

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## Is Automatization Permanent?

- Gain Conscious Awareness and Control of Automatic Processes
- Innate vs. Acquired
- Roots in the 1960s
  - Counterculture Movement
  - Psychedelic Drugs as a Route to Mystical Experience

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## Methodological Problems

- Studies of Religious Practitioners
  - Lack of Pre-Meditation Baselines
  - Self-Selection
  - Conflicting Vocabularies, Epistemologies
- Random Selection
  - Neophytes vs. Adeptes
  - Absence of Sociocultural Surround

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## Meditation as a Route to De-Automatization?

- Not Much Research
  - Too Much Focus on Somatic Effects
    - “Relaxation Response”
  - Failure to Use Standard Tasks
- Constraints on De-Automatization
  - Sometimes Automatization is Adaptive

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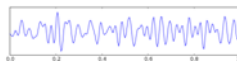
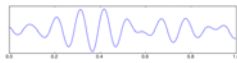
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## EEG Alpha Activity

- 8-12 cps, 10-150 microvolts
  - Occipital-Parietal Region of Brain
- Correlates
  - Arousal (Sleep)
  - Eyes Closed vs. Eyes Open
  - Cognitive Activity (“Looking”)
- Phenomena
  - Alpha Density
  - Blocking (Orienting Response)
    - Replaced by Beta Activity
  - Habituation of Blocking



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### Increased Alpha Activity?

- Artifact of Eyes Closed
- Habituation
- “Not Looking”
- Not Associated with Particular State
  - Expectations

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### Psychophysiology of Yoga

Anand, Chhina, & Singh (1961)

- Raja Yoga, *Samadhi* Meditation
  - Oblivious to External, Internal Stimuli
- Subjects
  - 2 Experienced Yogis
  - Yogis-in-Training
- EEG Alpha
  - Density
  - No Blocking to Stimulus
  - No Habituation of Blocking

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### Psychophysiology of Zen

Kasamatsu & Hirai (1966)

- Subjects
  - Zen Masters, Disciples
- Practicing *Zazen*
  - Sitting, Eyes Open, Focused in Front
- EEG Alpha
  - Increased Density Despite Open Eyes
  - Blocking to Stimulus
  - No Habituation of Blocking
- EEG Theta
  - Increased Density Towards End



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## Yoga and Zen Compared

Anand et al. (1961); Kasamatsu & Hirai (1966)

- Increased Slow-Wave Activity
  - Increased Alpha, Decreased Alpha Frequency
  - Increased Theta Activity
- Alpha Blocking
  - In Yoga: No Blocking
  - In Zen: Blocking Does Not Habituate

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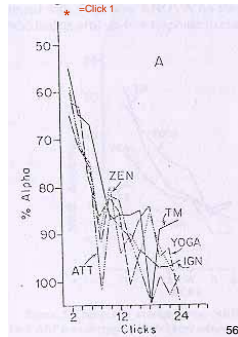
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## Failure to Replicate

Becker & Shapiro (1981)

- Practitioners
  - Zen
  - Yoga
  - Transcendental Meditation
- Controls
  - Attend to Stimulus
  - Ignore Stimulus
- No Effects on EEG Alpha Blocking, Habituation



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## Startle During Meditation

Levenson, Ekman, & Ricard (2012)



- Subject M.R.
  - Buddhist Monk with 40 Years' Experience
  - PhD in Biochemistry
- Acoustic Startle: 6 Trials x 4 Conditions
  - "Open Presence" Meditation: "Pure Awareness"
  - Focused Meditation: Fixed Point
  - Distraction: Recall Details of Past Event
  - Unanticipated Startle
    - Comparison with Nonmeditator Controls

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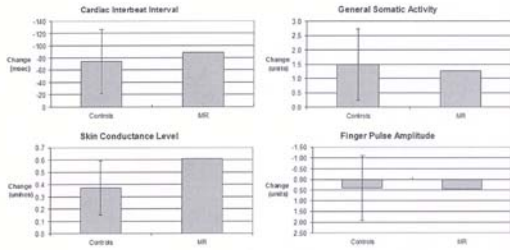
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## Comparison with Controls

Levenson et al. (2012)



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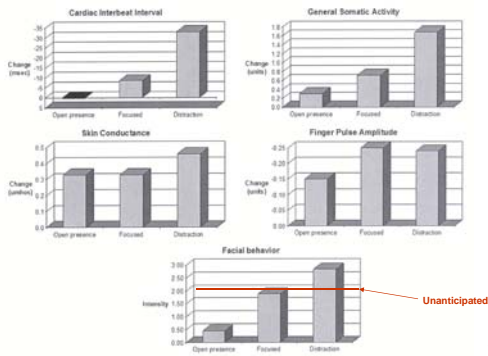
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## Startle During Meditation

Levenson et al. (2012)



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## Cognitive Effects of Tibetan Buddhist Meditation

Carter, Presti, et al. (2005)

- 76 Tibetan Monks
  - 5-54 Years Training
  - 3 “Retreatist” Meditators, > 20 years
- 2 Forms of Meditation
  - Compassion
    - Contemplation of Suffering in the World
    - Emanation of Loving Kindness
  - One-Point
    - Focus Attention on Single Object
    - Calm Mind, Reduce Internal/External Distractions<sup>60</sup>

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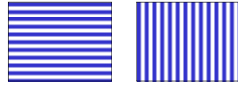
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## Binocular Rivalry

Porta (1593); Wheatstone (1838); Breese (1899, 1909)

- Present Different Images to Each Eye
  - Horizontal vs. Vertical Grating
- Random Alternation Between Images
  - Essentially Automatic



- Measures
  - Rivalry Rate (# Periods of Exclusive Visibility)
  - Phase Duration between Switches
  - Duration of each Period of Rivalry

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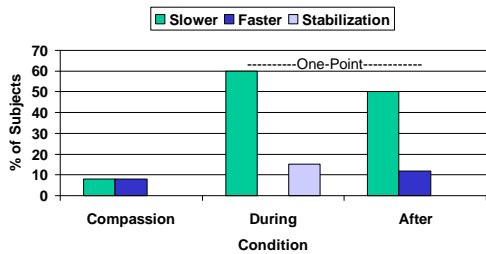
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## Binocular Rivalry During Meditation

Carter, Presti, et al. (2005)



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## Cognitive Functions in TM

Alexander, Langer, et al. (1989)

- Elderly Retirement Home Residents
- Practice 20 Minutes, 2x Daily, 12 Weeks
  - TM
  - Guided Attention (“Mindfulness”)
    - Word Production
      - Think in “New and Creative Ways”
  - Mental Relaxation
  - Control

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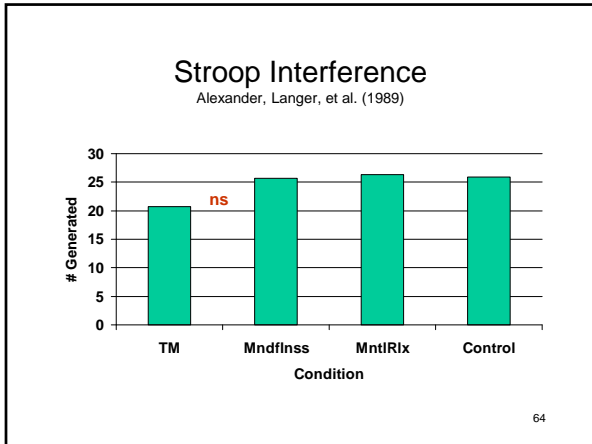
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### Cognitive Consequences of Meditation

Wenk-Sormaz (2005)



- De-Automatization
  - Reduction in Habitual Patterns of Response
- Secular Meditation Exercise
  - Essentially Mindfulness Meditation
- Stroop Task
  - Before and After Meditation
  - Rest Control

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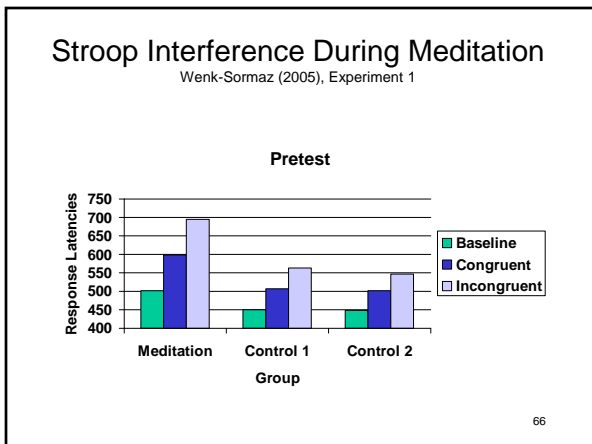
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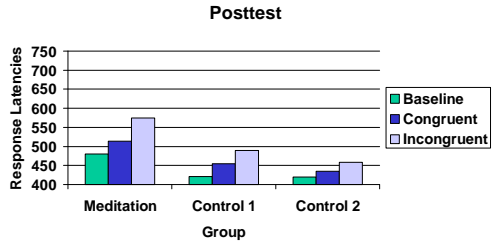
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## Stroop Interference During Meditation

Wenk-Sormaz (2005), Experiment 1



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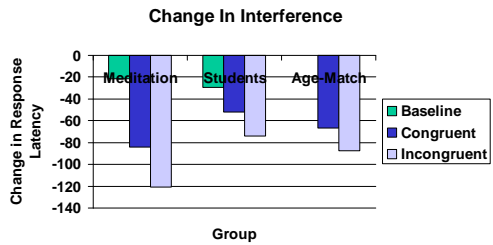
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## Stroop Interference During Meditation

Wenk-Sormaz (2005), Experiment 1



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## Attentional Strategies

Wenk-Sormaz (2005), Experiment 2a



- Meditation
- Rest
- Learning
  - Cognitive Control
  - Use Method of Loci to Learn Wordlist

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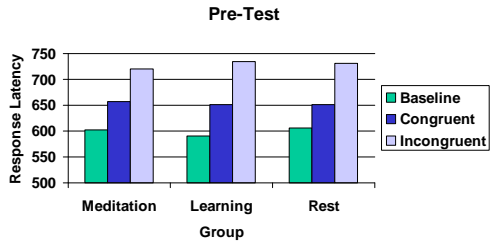
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## Stroop Interference During Meditation

Wenk-Sormaz (2005), Experiment 2a



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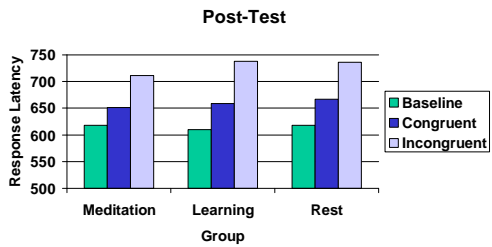
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## Stroop Interference During Meditation

Wenk-Sormaz (2005), Experiment 2a



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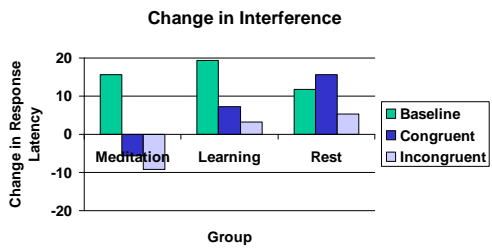
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## Stroop Interference During Meditation

Wenk-Sormaz (2005), Experiment 2a



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## Meditation and De-Automatization

Wenk-Sormaz (2005)

- Meditation Leads to De-Automatization
  - Reduced Stroop Interference
    - Not Artifact of Relaxation, Arousal
  - Reduced Habitual Categorization
    - When Such Reduction is Optimal
- Effects of Meditation are *Secular*
  - Naïve Subjects, Randomly Assigned
  - No Theological/Cultural Overlay



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## Mindfulness-Based Stress Reduction

Kabat-Zinn (1990); Bishop et al. (2004)



- Secularized Derivative of Buddhist Practice
  - Moment-to-Moment Nonjudgmental Awareness
- “Operational Definition”
  - Sitting Meditation
    - Focus on Somatic Sensations of Own Breathing
  - Notice Thoughts and Feelings, Let Them Go
    - Return Attention to Breathing
  - Continue Practice Outside Formal Meditation
    - Focus Awareness on the “Here and Now”
    - Use Breathing as an Anchor

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## Two-Component Model of Mindfulness

Bishop et al. (2004)

- Self-Regulation of Attentional Focus
  - Alert to the Here-and-Now
    - Non-Elaborative Awareness (“Beginner’s Mind”)
  - Metacognitive Attentional Skills
    - Sustained Attention
    - Switching Attentional Focus
- Orientation to Experience
  - Attitude of Curiosity
  - Openness
  - Acceptance

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## Toronto Mindfulness Scale

Lau et al. (2006)

- **Curiosity**
  - I was curious about my reactions to things.
  - I was curious about what I might learn about myself by taking notice of how I react to certain thoughts, feelings, or sensations.
- **De-Centering**
  - I was more invested in just watching my experiences as they arose, than in figuring out what they could mean.
  - I was more concerned with being open to my experiences than controlling or changing them.

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## Five-Facet Mindfulness Scale

Baer et al. (2006, 2008)

- **Nonreactivity to Inner Experience**
  - I perceive my feelings and emotions without having to react to them.
- **Observing/Noticing/Attending to Sensations/Perceptions/Thoughts/Images**
  - I pay attention to sensations, such as the wind in my hair or sun on my face.
- **Acting with Awareness**
  - I find myself doing things without paying attention. (-)
- **Describing/Labeling with Words**
  - I'm good at finding the words to describe my feelings.
- **Nonjudging of Inner Experience**
  - I make judgments about whether my thoughts are good or bad (-)

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## Psychological Effects of Mindfulness Meditation

- **Most Studies Involve Physiology, Emotion**
  - Heart Rate, Blood Pressure
  - Mood, Anxiety
- **Origins as Stress-Reduction Technique**
  - Cognitive Change to “End Suffering”
- **Effects on Stress, Emotion**
  - But What About Cognitive Change?

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## MBSR and Cognitive Flexibility

Moore & Malinowski (2009)

- Meditators vs. Nonmeditators
  - Completed 6-Week “Beginner’s Course”
- Cognitive Tasks
  - Standard Stroop Test
  - “D2” Concentration and Endurance Test
    - Target-Cancellation Task
    - Multiple Measures of Attention

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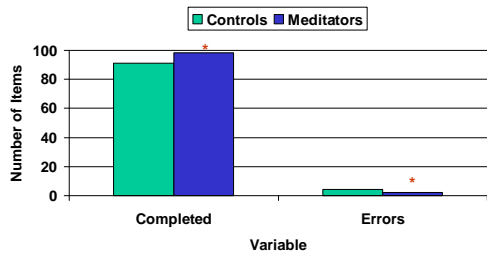
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## Stroop Test Performance

Moore & Malinowski (2009)



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## Hypnotic Effects on Stroop Interference

Raz et al. (2002)

- Highly Hypnotizable Subjects
- Suggested Agnosia (Alexia)
  - When I clap my hands, meaningless symbols will appear in the middle of the screen. They will feel like characters of a foreign language that you do not know, and you will not attempt to attribute any meaning to them. This gibberish will be printed in one of four ink colors....

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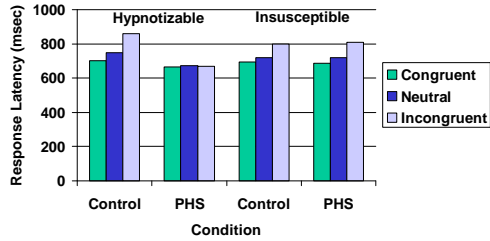
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## Stroop Task Performance

Raz et al. (2002)



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## Meditation and De-Automatization

- Stroop as Index of Automatic Processing
  - “Gold Standard”
- Meditation Reduces Stroop Processing
  - Not “Dose Dependent”
    - 15 Minutes vs. 6-8 Weeks
- But Effects Relatively Minor
  - Compared to Hypnosis
    - Suggested Agnosia/Alexia vs. Color-Blindness
- Maybe Stroop Isn’t the “Gold Standard”?
  - At Least for Meditation

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