



A Center In the Network for the Study of Health Beliefs & Behavior

Cognitive Science Speaks to the "Common-Sense" of Chronic Illness Management

Howard Leventhal, PhD

**Director: Rutgers Center for the Study of Health Beliefs & Behavior
Institute for Health & Department of Psychology, Rutgers University**

Associate Directors

Elaine A. Leventhal, MD, PhD

Department of Medicine, Robert Wood Johnson School of Medicine

Ethan Halm, MD

Chief, Division of General Internal Medicine, Department of Medicine, U Tx Dallas

Richard Contrada, PhD

Department of Psychology & Institute for Health, Rutgers

Cognitive Science Speaks to the "Common-Sense" of Chronic Illness Management

&

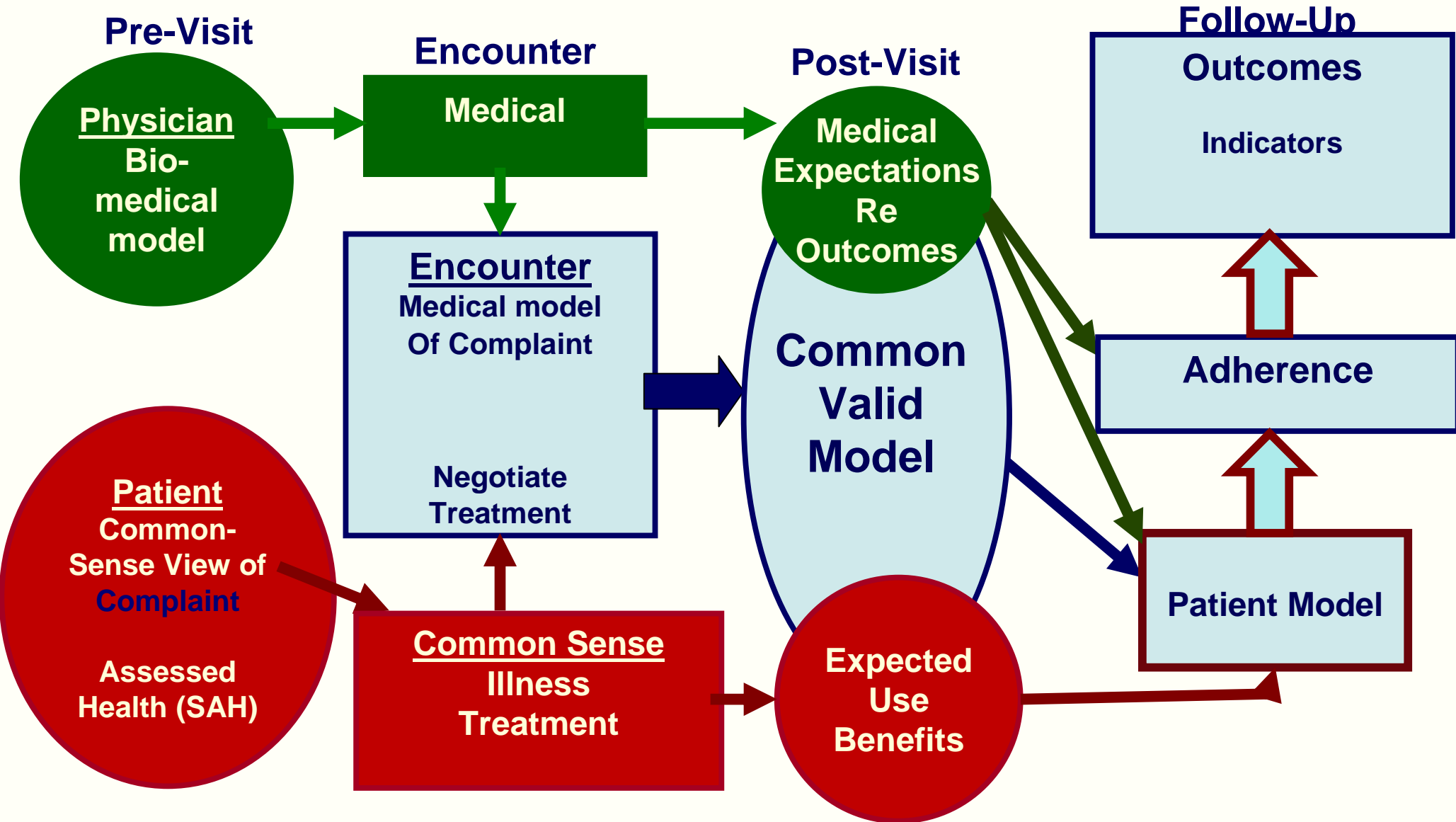
"Common-Sense" of Chronic Illness Management Speaks to Cognitive Science

A BI-DIRECTIONAL CONVERSATION!

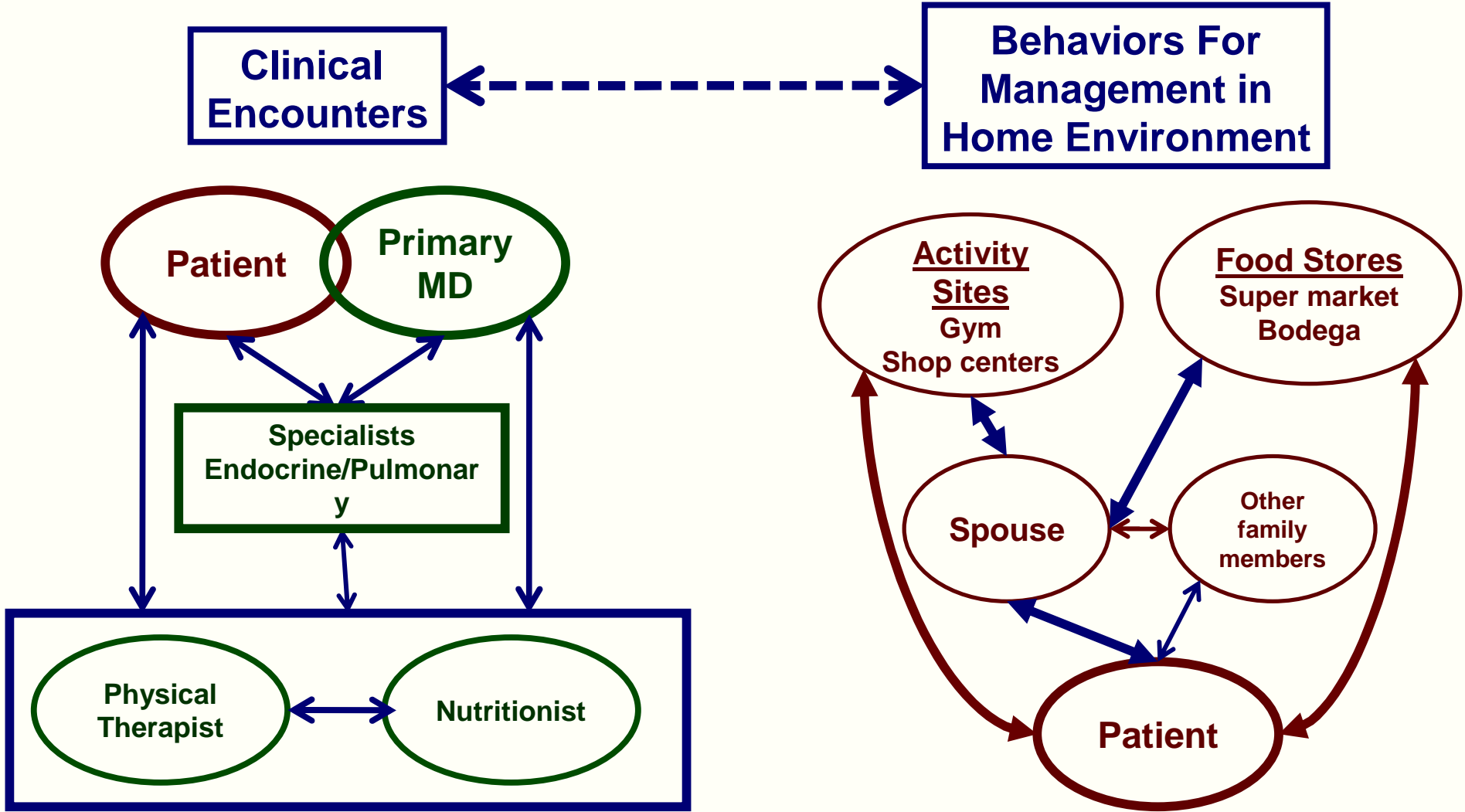
Begin with the Clinical Encounter



The Medical Encounter: What does the patient bring & with what does s/he leave?



EXPERTISE in PATIENT CENTERED Models: Essential for SHAPING MANAGEMENT in the PATIENT'S WORLD



Expertise in *PERSONALIZED* Medicine

1: BIO-MEDICAL EXPERTISE

a: Diagnose (Cause of presenting problem, i.e., Symptoms, Function, Patho-physiology, Anatomy, etc.)

b: Treatment protocol to Manage/Cure (Meds; Behavior; Tests; Referral)

2. BEHAVIORAL-ADHERENCE EXPERTISE

a: Diagnose Patient's CSM of Disease & Treatments

(Cause of problem, Symptoms, Function, Expectations re Outcomes, Monitoring Schedules, etc.)

b: Create Treatment Protocol For Patient's Environment

(Cues for Action & treatment efficacy; How to act; Time for action, Consequences of Action, etc.)

Translational Research For PERSONALIZED Diagnosis & Treatment

Cellular Genetic – Nuclear DNA / Ribosomal Processes

Socio-Economic Environment : Context for Life Span Development



Gene Expression: Proteomics; mRNA; Methylation; etc.

TASKS
for the
CLINICAL
CONSULT



BIOLOGY of This PATIENTS DISEASE



PROTOCOL for TREATMENT of This PATIENTS DISEASE

Translational Research to Implement PERSONALIZED Treatment - Adherence

TASKS
for the
CLINICAL
CONSULT

PATIENT CENTERED CSM FOR DIAGNOSIS & TREATMENT

PATIENT CENTERED CSM For BEHAVIORAL MANAGEMENT

Cognitive Science of CSM for Communication & Management

Cultural & Socio-Economic Processes: Context for Life Span Development

Cognitive Neuroscience of CSM for Communication & Management

OBJECTIVES

1. MODELS THAT EXPLAIN & PREDICT

HOW Patients Create, Validate, & Maintain, PERSONAL VIEWS Of Disease & Treatment

2. PEOPLE ONLY PARTIALLY AWARE OF THESE PROCESSES

3. Models of Processes Underlying Everyday Behavior & Communication Can Enhance Behavioral Approaches For Improved Health Outcome

PREDICTION WITHOUT EXPLAINING

POINT TO BUT DO NOT SPECIFY UNDERLYING PROCESSES

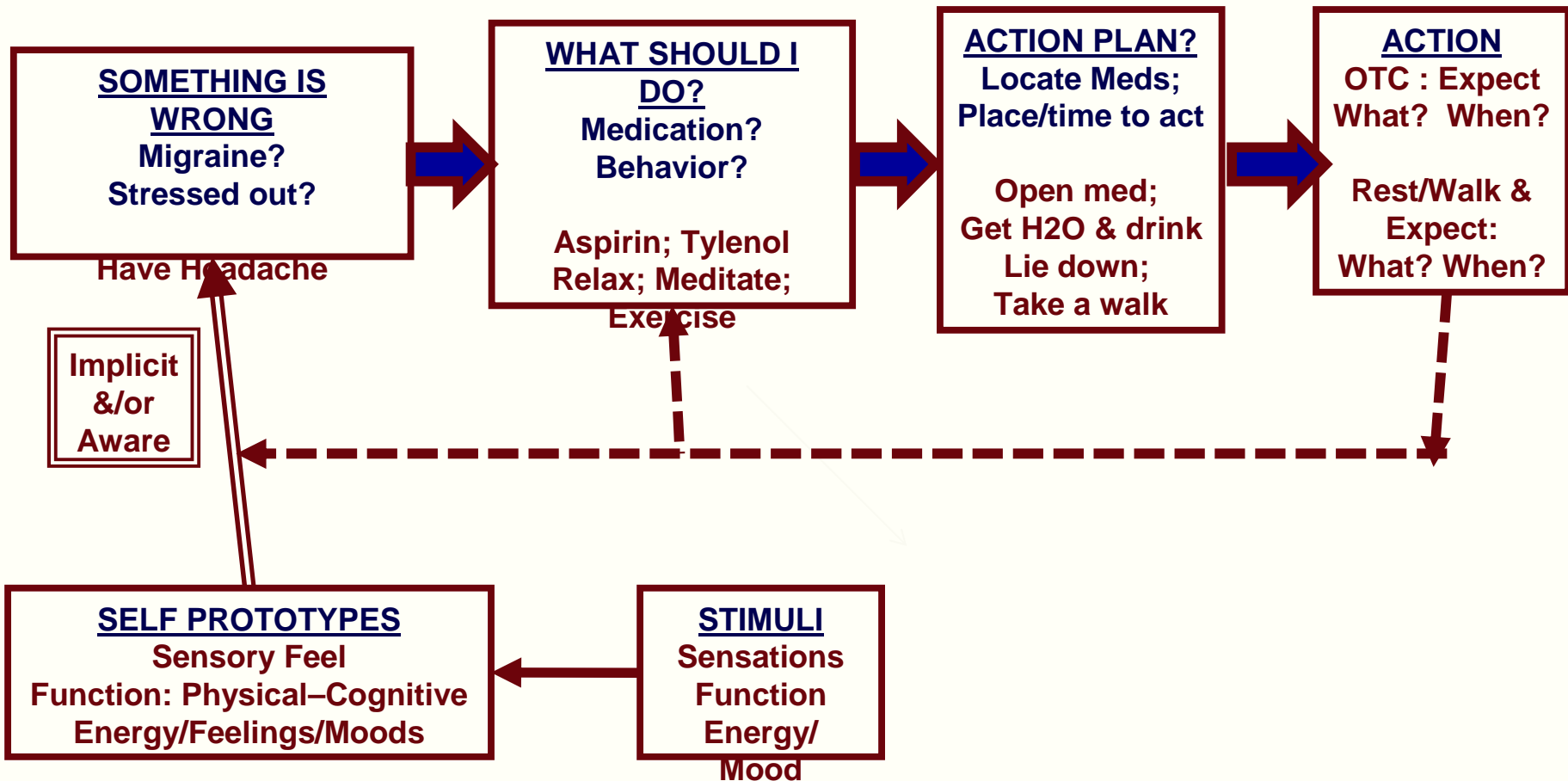
Self Efficacy, Intention, Optimism, Self Esteem, Depression, etc.

SELF ASSESSED HEALTH (SAH) PREDICTS MORTALITY

SAH DOES NOT EXPLAIN MORTALITY

A Diagram of Common Sense?

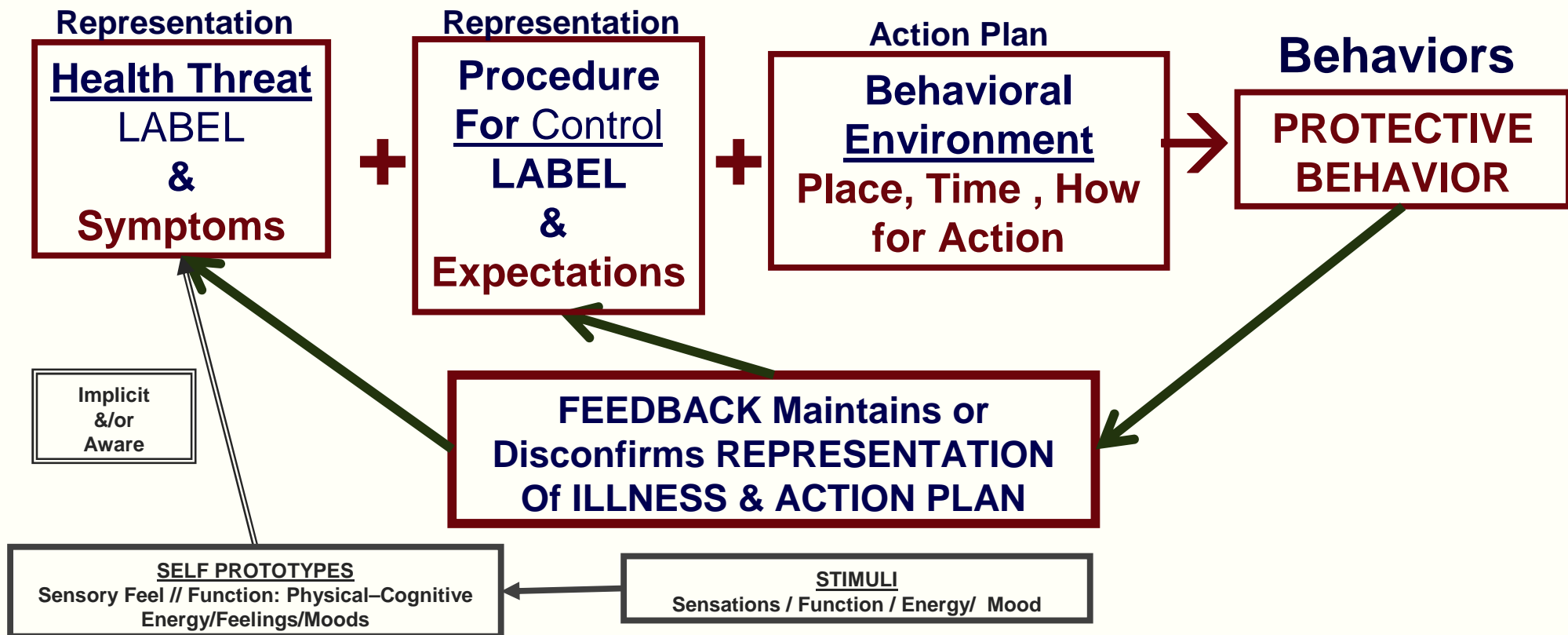
Paine, Tom (1776); Sensible, Anyone (3010)



COMMON SENSE MANAGEMENT –CSM- in Behavioral Language

Involves 3 REPRESENTATIONS (HL, 1970)

*ILLNESS / PROCEDURE / ACTION PLAN
BEHAVIOR, EXPECTATIONS, & FEEDBACK*



5 Topics Relating CSM & Cognitive Science

- 1: : How Experience Maps to Concepts: CSM Illness Representations**
- 2: Communication & Elaboration of CSM**
- 3: Connecting Illness Representations to Procedures & Action Plans**
 - a) Feed-back relationship**
 - b) Feed-forward relationship**
- 4: Executive Function: Prototypes of SELF; Screening & Deciding**
 - a) Expectations & Prediction of Future**
 - b) Executive Selections**
- 5: Constituents of SHARED Management from CSM Perspective**

1: CSM Representation of Illness: How Experience Maps to Concepts

Experiential Tradition For Semantic Representations

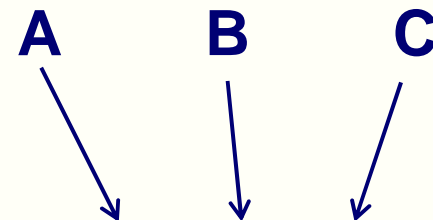
Locke (1632-1704); Quillian (1967); Smith, EE, Shoben, Rips (1974); McClelland & Rumelhart (1985)
Details From: Andrews, Vigliocco, & Vinson, (2009). Psychological Review. 116, 463-498 & Kahneman & Miller, 1986

Perceptual Elements at the base of a Hierarchy



Comparing Reality to its Alternatives Kahneman & Miller, 1986

Category Labels



Elements ← Context

Stimulus

A large blue arrow points upwards from the word 'Stimulus' to the word 'Elements'.

AVAILABILITY: Affected by Context & Category That Evaluate p of Fit of Elements to Label

Elements in CSM Are Defined

They Have Content / Neurologically locatable

Operation Visible in Specific Contexts

Matching Experience to Prototypes: Prototype Checks (PC)

CHECKS

Somatic
Spatial &
Temporal

Location: Caused by organ at specific location

Sensory properties: Sharp, dull, pressure, ache, throb

Severity: Pain & disruption of physical &/or mental function

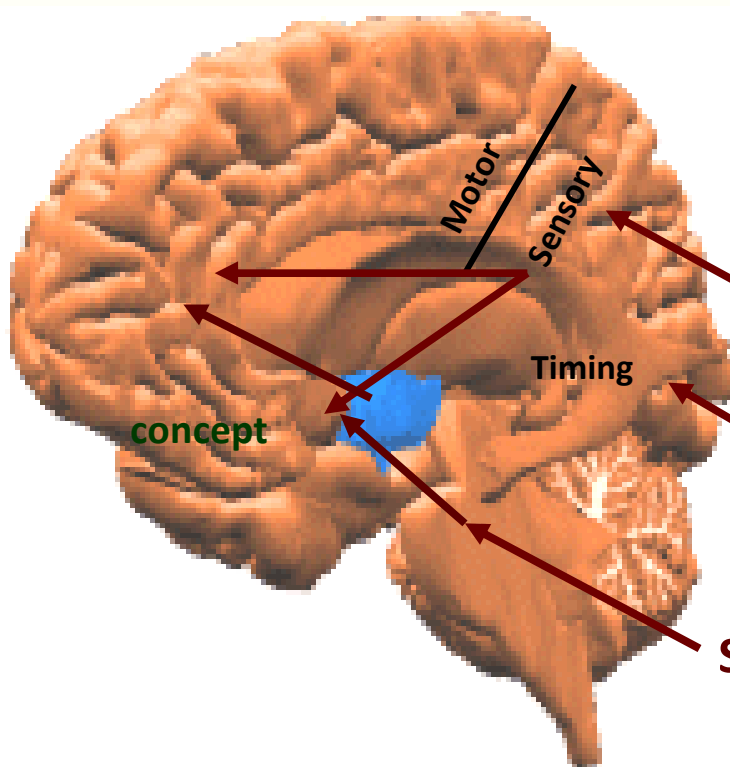
Duration: Felt time & clock time : Exceed expectations (Mora et al (2002). *Psychosomatic Medicine*)

Trajectory/Stability/ Predictability

Functional
& Affective

Cognitive/Physical: Slowing; Unbalanced; etc.:

Negative Feelings: Distress, disgust etc. = Sick



ILLNESS PROTOTYPES = Concept + Somatic
Experience that Underlie Representations

Perceptual-Cognitive brain structure

ACTIVE
(location/severity/duration)
Processing

Location &
Sensations
Duration
Severity

Somatic Sensations & Functions
DEVIATIONS FROM **NORMAL** SELF

Neuroscience Evidence for Experiential Nature of Semantic Representations With Relevance to CSM

EXAMPLES

Sensory & Motor Areas – Homunculi in the Brain

Martin, & Jessell, 1991. Principles of Neuroscience. Kandel Schwartz, & Jessell (Chapters 23 -25).

Premotor & Motor cortices activated by language referring to body action

Aziz-Zadeh, Wilson, et. al., 2006

Localized motor areas activated by lexical items with motor associations

(Buccino, et al., 2005)

2: Interpersonal Communication & the Elaboration of CSM

Andrews, Vigliocco, & Vinson, (2009). Psychological Review. 116, 463-498

Distributional Tradition For Semantic Representations

“The meaning of a word is its use in language” Wittgenstein (1953/1997)

“Firth suggested that “you shall know a word by the company it keeps” and that human beings learn at least part of the meaning of a word from “its habitual collocation” with other words (Firth, 1957, p. 11)” Andrews et al., Pg. 465

Cognitive Science

Computer Models of Co-Occurrences in Text Can Define/Use/Meaning of Words
Of Things UNSEEN

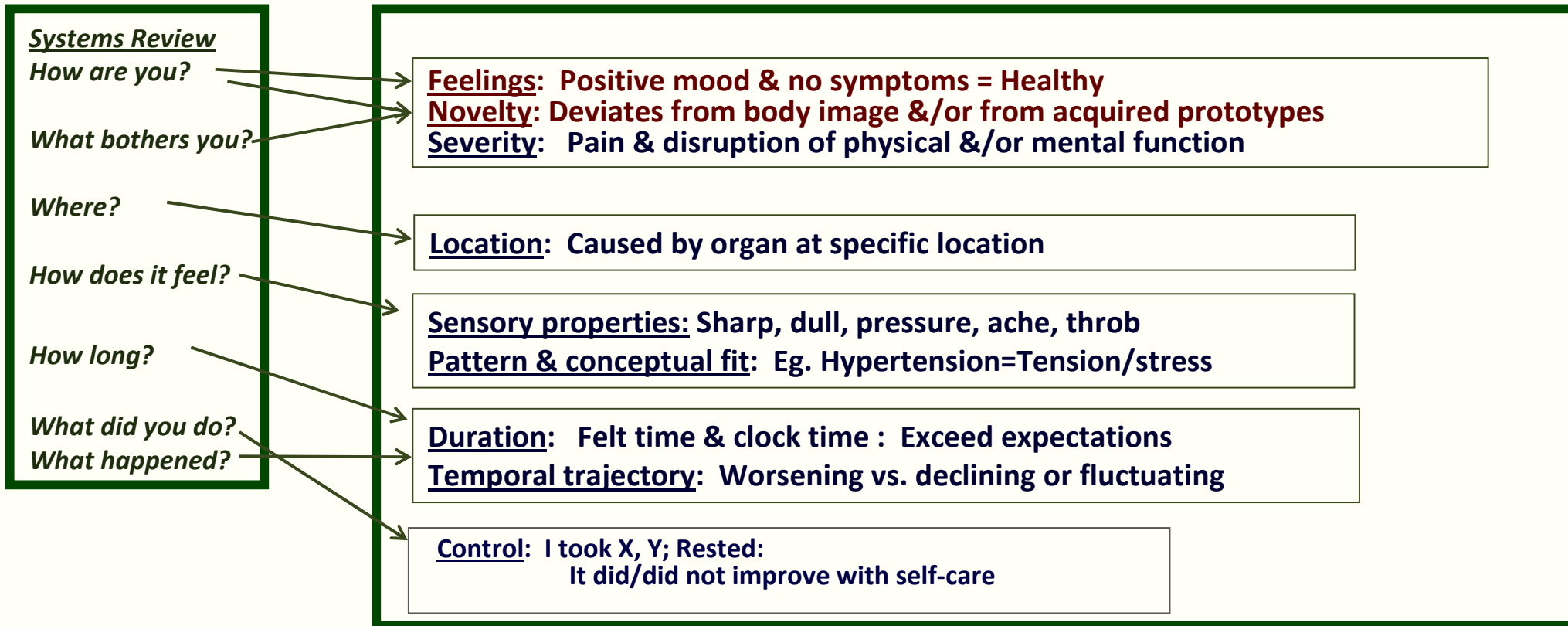
2: Interpersonal Communication & the Elaboration of CSM

PCs CONNECT THE INDIVIDUAL MIND TO THE SOCIAL SYSTEM

Clinicians Explore Presenting Complaints & Conduct a Review of Systems to Form Hypotheses for Diagnosis & Treatment & Determine the Need for Additional Tests

MD

PATIENT



2: Interpersonal Communication & the Elaboration of CSM

PCs CONNECT THE INDIVIDUAL MIND TO THE SOCIAL SYSTEM CREATING CONCEPTS FOR THINGS UNSEEN

Clinicians Explore Presenting Complaints & Conduct a Review of Systems Forming Diagnoses, Treatment Protocols & Suggestions for Additional Tests

Hypotheses Re Underlying Causes Virus – Bacteria – Inflammation Immune Response

Unseen potentially available to Experience

**Action Based on Inference Re Virus, Bacteria, etc.
The Unseen is Justified by Linking Abstractions to
Expectations & Outcomes of Action**

Because you were: Exposed; Consumed; Stressed; Life style; etc.

Cardiac symptoms that create different representations

Easily Defined as Heart Myocardial Infarction - MI

<u>Symptoms</u>	<u>Check</u>
Chest Pain	Location/pattern (MI)
Profuse Sweating	Novelty (?MI)
Shoulder pain	Pattern/location (MI)
GI Distress	Location (GI)

Bunde, J., & Martin, R. (2006). *Psychosomatic Medicine*.

Shared Illness Representations

<u>Patient</u> HEART ATTACK!!
<u>Physician</u> HEART ATTACK!!

Patient: Stomach upset

Misperceived as NON Heart Congestive Heart Failure - CHF

<u>Symptoms</u>	<u>Check</u>
Frequent Dyspnea	Location - Trajectory
Chronic Fatigue	Age (Duration/Location)
Feet Swollen	Location - Feet

Horowitz, C.R., Rein, S.B., Leventhal H. (2004). *Social Science & Medicine*.

Different Representations

<u>Patient</u> AGING
<u>Physician</u> HEART FAILURE!!

2: Interpersonal Communication & the Elaboration of CSM

Depression and pre-hospital delay in the context of Myocardial Infarction

Bunde, J., & Martin, R. (2006). *Psychosomatic Medicine*.

Sample: N = 433 Males: 307 Mean Age = 59.8Yrs

Procedure: Phone Interviews, 8 days post MI (on average)

Time Onset to Care Seeking	Depressed - 16hr 9'	Not Depressed - 8hr 55'	.02
-----------------------------------	----------------------------	--------------------------------	------------

Survival analyses for Delay in Care Seeking

Seek Care

Quickly

Slowly

	HEURISTICS	Multivariate	p
History of MI	Location/Pattern	.21	.12
Depression		.32	.007
Fatigue	Age/not illness	.13	.007
Sleep Disturbance		.08	.05
Sweating	Novelty/uncertainty	.23	.03
GI Distress	Non Heart Location	.37	.001
Chest/arm pain	Location/Pattern	.24	.02
Symptom serious	Severity	.12	.03

Abstractions Integrate Episodes & Span Time

CHF: Absence of Depth -- No connection of symptoms to label

“When you hear about having heart problems, ...you’re supposed to feel maybe a pain in your left arm, maybe a pain in your chest, or pressure. I couldn’t describe what I felt as pressure but it must have been that, uh because I had to struggle in order to talk... .. if I had chest pain and then I would have said, okay, I’ll call and say I’m having chest pain.....”

CHF: No depth → No monitoring of change: Lack of BREADTH

Interviewer Q: “During the week, you said you weren’t feeling that great...”

Patient: “Maybe I was kind of tired but it just didn’t seem to be anything out of the ordinary.”

Interviewer Q: “Were there any warning signs earlier?”

Patient: “Not that I could detect. Like I said I didn’t feel that great. Oh, I guess that I could have gone to the doctor after I had that collapse on the hallway floor. It might have been a good idea.”

Symptoms not linked to procedures: Not a coherent chronic model

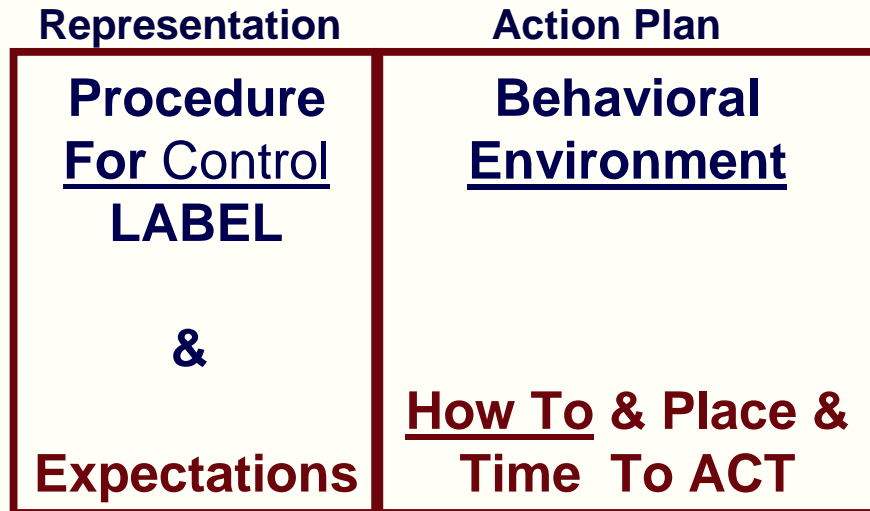
**By Connecting Symptoms/Function with Concepts
Patients Interrelate Experiences [Sx & Function]
That Would Otherwise Be Separate
&
Join Sx to Action Plans, Specific Actions &
Feelings Creating Behavioral & Emotional
Components of Prototypes**

Need cognitive references ;; could mention flashbulb memories??

A) Representations of Procedures & Action Plans

Procedural Knowledge / Non-Declarative Memory

Ryle, G. (1946); Milner, 1954; Scoville & Milner, 1957



Action Plans
Leventhal, 1970

**Affordances &
Situativity of Learning**

**Pathways in the
Perceived Environment**

Gibson, 1979; Greeno, 1998

Gibson, J. (1979) The visual world.

Greeno, J.G. (1998) The situativity of knowing, learning & research. *American Psychologist*, 53, 5-26

Ryle, G. (1946), "Knowing How and Knowing That", *Proceedings of the Aristotelian Society*, XLVI. *Collected Papers*, vol. 2, 212-225.

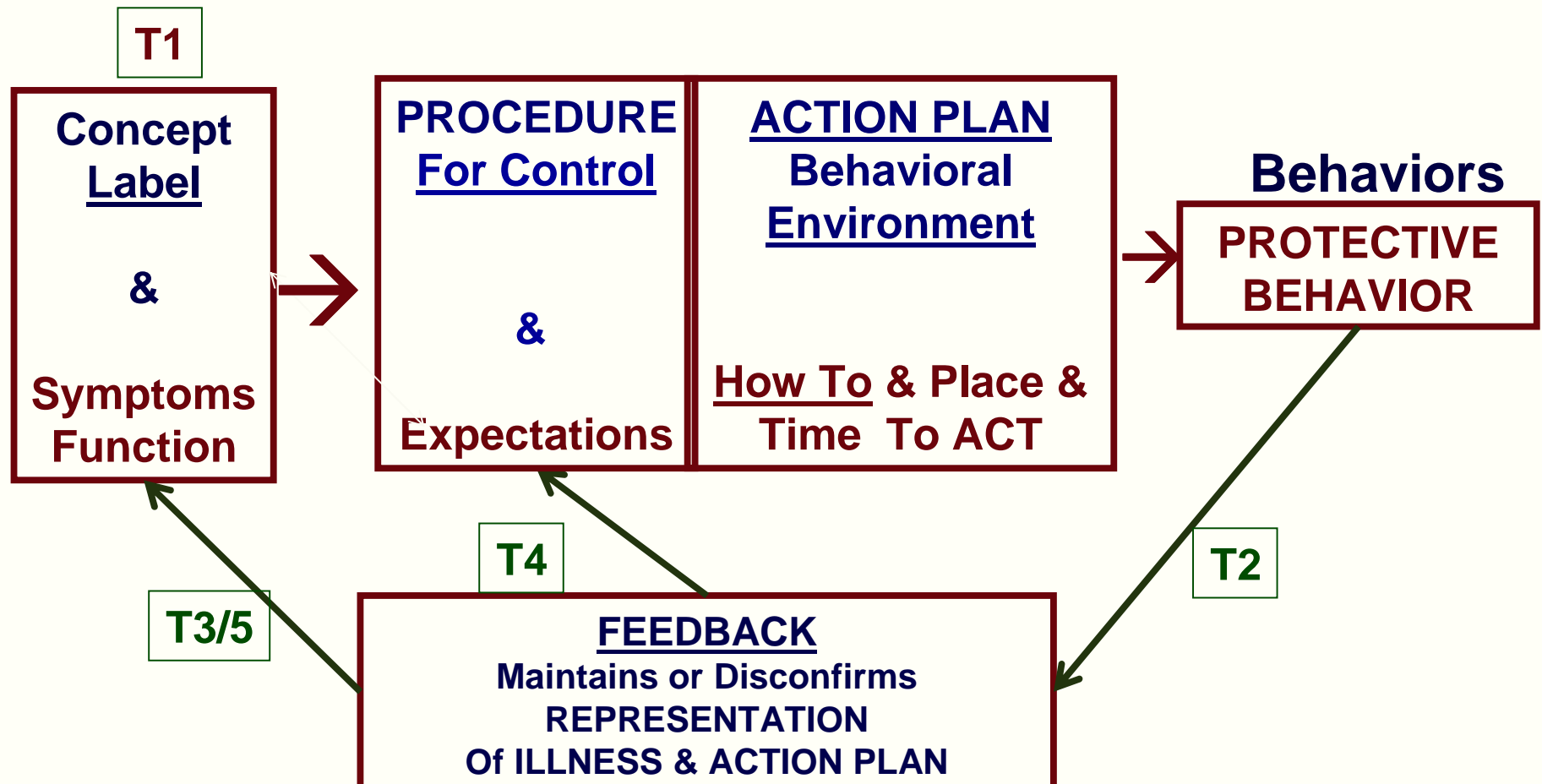
Milner, B. (1957). Intellectual function of the temporal lobes. *Psychological Bulletin*, 51, 42-62.

Scoville, W.B. & Milner, B. (1957) Loss of recent memory after bilateral hippocampal lesions. *Neurology & Neurosurgery*, 20, 11..

Leventhal, H. (1970). Findings and theory in the study of fear communications. *Advances in Experimental Social Psychology*, 5, 119-186

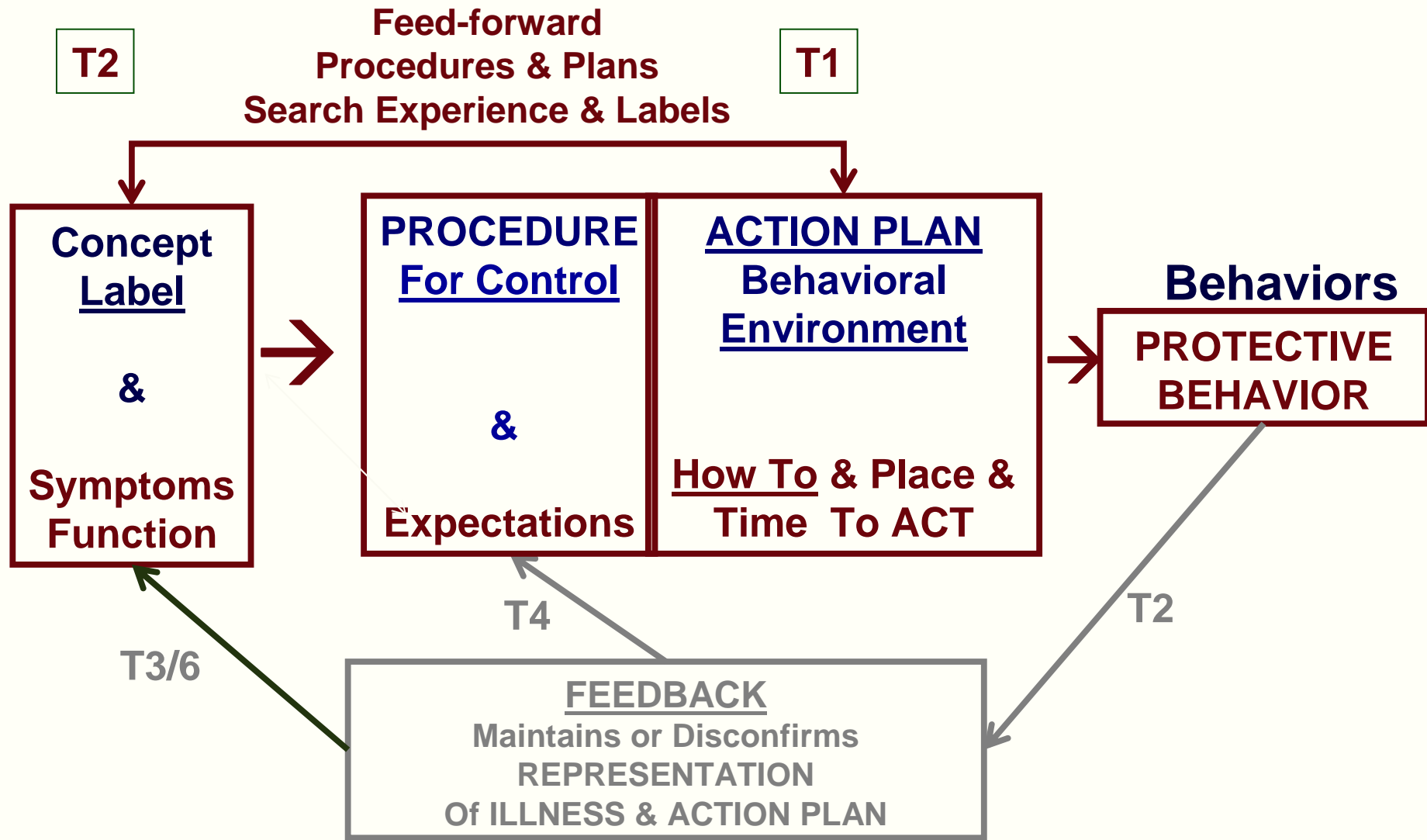
4: Connecting Representations of Illness, Procedures & Action Plans: a) Feed-back

Feed/Back Connections for Perception & Action



4: Connecting Representations of Illness, Procedures & Action Plans: b) Feed-forward

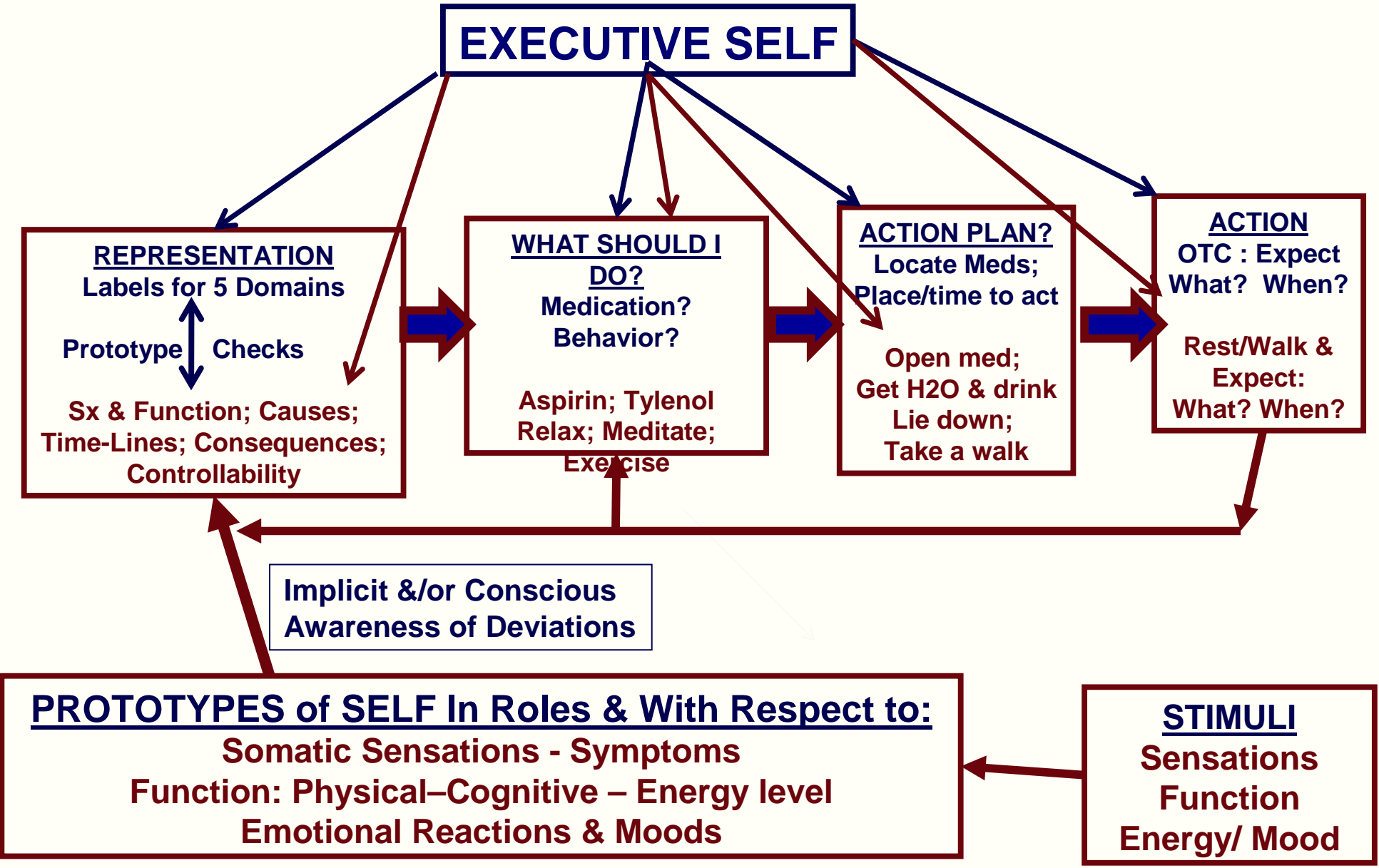
Feed/Forward Connections for Perception & Action



The Function of the Nervous System is to Support BEHAVIOR for Adaptive Action

Living organisms that do not Behave do not have nervous systems.

4: Self System & Executive Function: a) Self Prototype & Prediction of future



EXECUTIVE PROCESS

Examines, Questions & Re-shapes Base Level Control Loops

Steps in CSM for Executive Function

1. Attend to Relevant Somatic Cues
2. Match to Illness Representation
3. Select Response
4. Evaluate Response Outcome

Problem Solving Sequence in Stroop Task

1. Attend to task relevant Processes
2. Bias to Task Relevant Representations
3. Select Information to guide Response
4. Evaluate the Response

Banich,, M.T. (2009) . Executive Function: The search for an Integrated account. Current Directions in Psychological Science, 18, 89-94.

**Both involve suppression – Don't Respond to Symptoms / To Color)
& Selective Activation**

Respond to Objective Cue (blood pressure/ SMBG) / to Word Content.

EXECUTIVE PROCESS

Examines, Questions & Re-shapes Base Level Control Loops

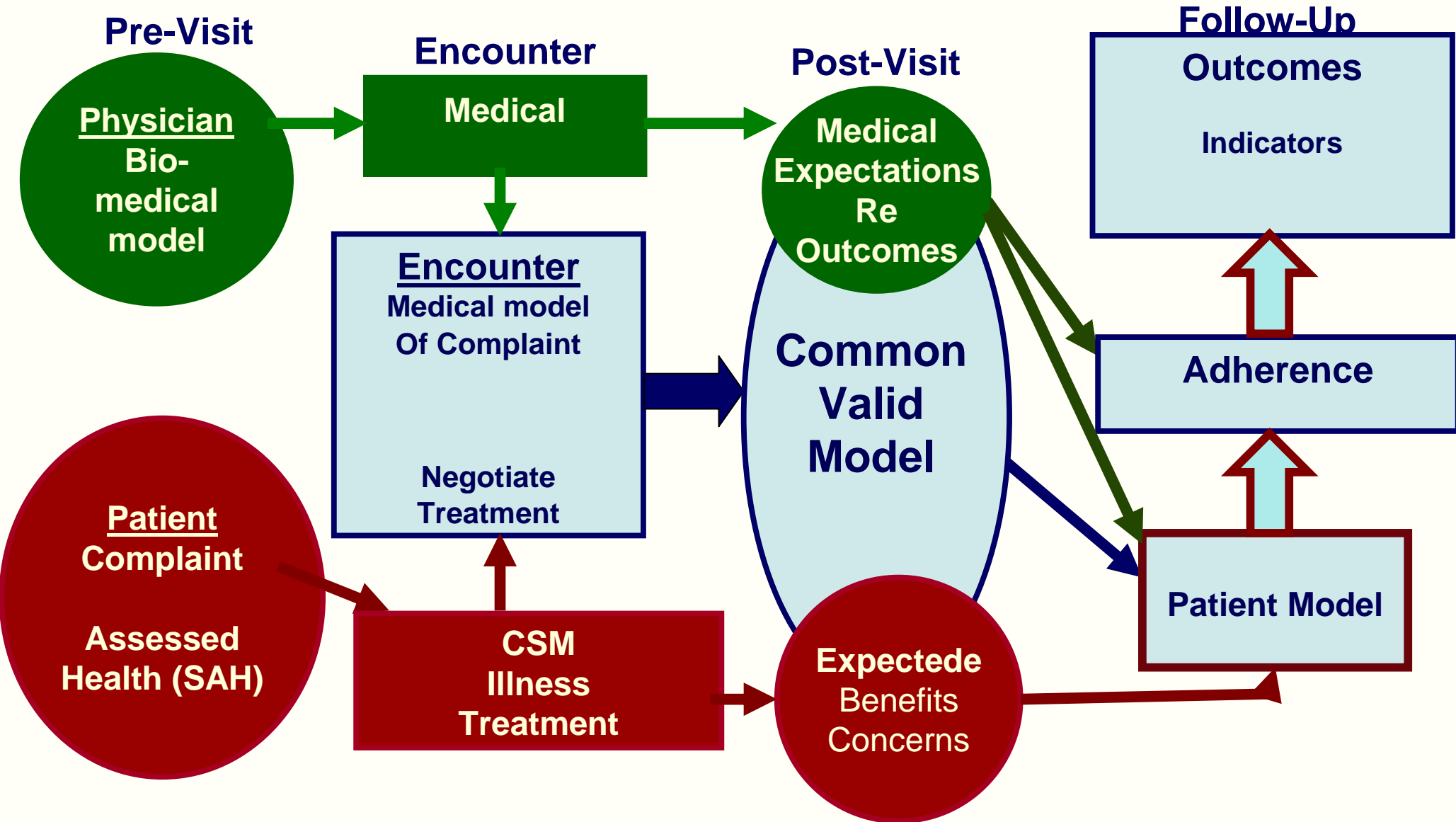
Did Interpretation/Action Make Sense?

1. Were start Up cues Valid?
2. What Prototype did they match?
3. Response/Procedure: Doable
4. Outcome: As & when expected
5. Did I monitor the right cues?
6. Should I try a different response?

5: Shared Management: Basic Constituents from CSM Perspective



The Medical Encounter: What does the patient bring & with what does s/he leave?



EXPERTISE in Personalized Medical PRACTICE

BEHAVIORAL-ADHERENCE EXPERTISE

**a: Observe: Symptoms, Function, Actions & Outcomes, Monitoring, etc. &
INFER PATIENT'S MODEL**

**b: Observe: Pt. Environment; Procedural/Skills; Outcomes perceived &
CREATE ACTION PLAN FOR Pts. ENVIRONMENT**

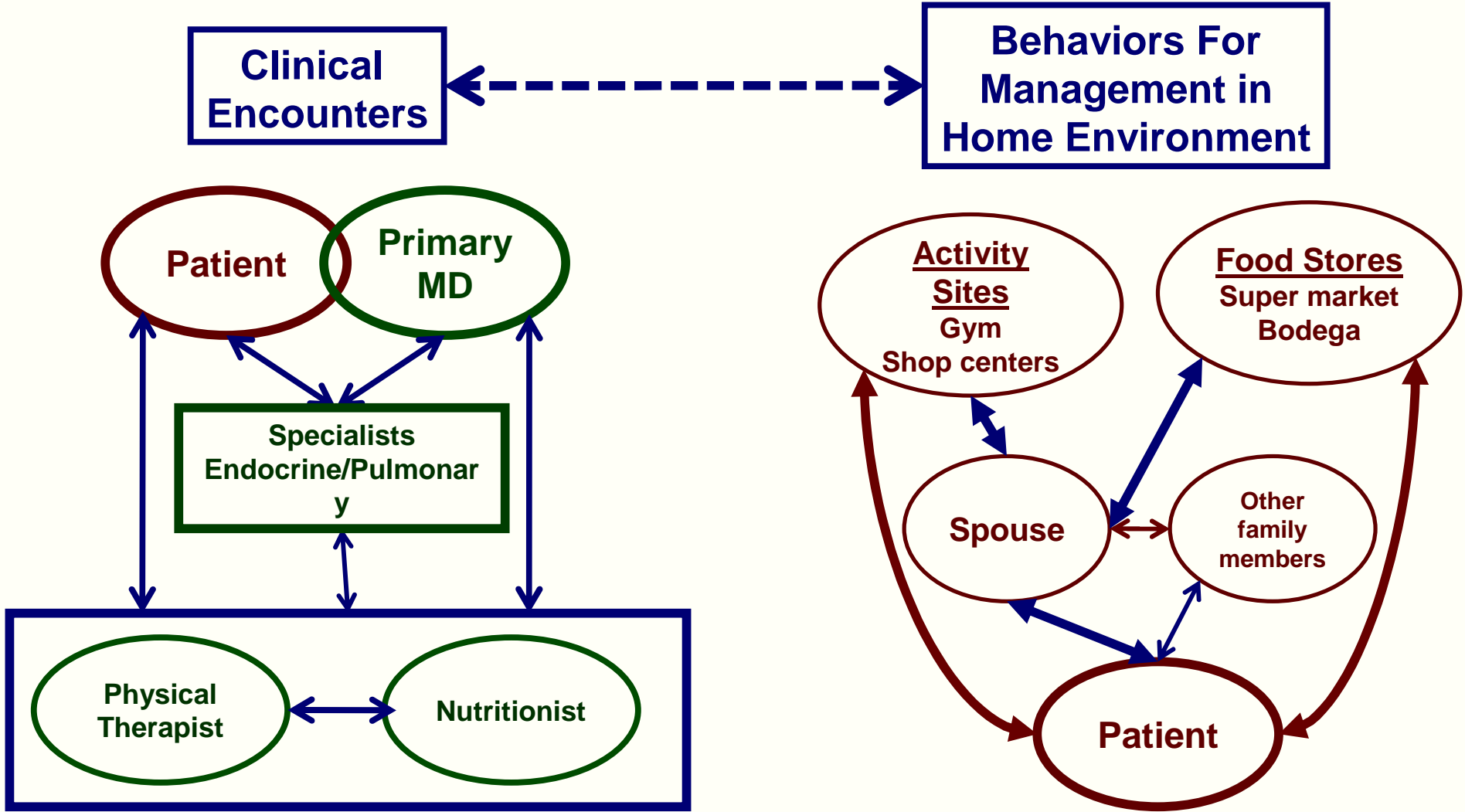
Theory of MIND

BIO-MEDICAL EXPERTISE

a: Diagnose (Cause of presenting problem, i.e., Symptoms, Function, Patho-physiology, Anatomy, etc.)

b: Design treatment protocol for Cure/Control (Meds; Behavior; Tests; Referral)

EXPERTISE in PATIENT CENTERED Models: Essential for SHAPING MANAGEMENT in the PATIENT'S WORLD



THEORY OF MIND

Two Sides to Perspective Taking

Patient Models & Behavior

Patient's Emotional States

Can Physicians Perceive

Patient Adherence?

Cues for Self Diagnosis & Seeking Care?

Cues for Treatment Efficacy?

Can Physicians Perceive

Patient's Emotional State?

Literacy & Comprehension?

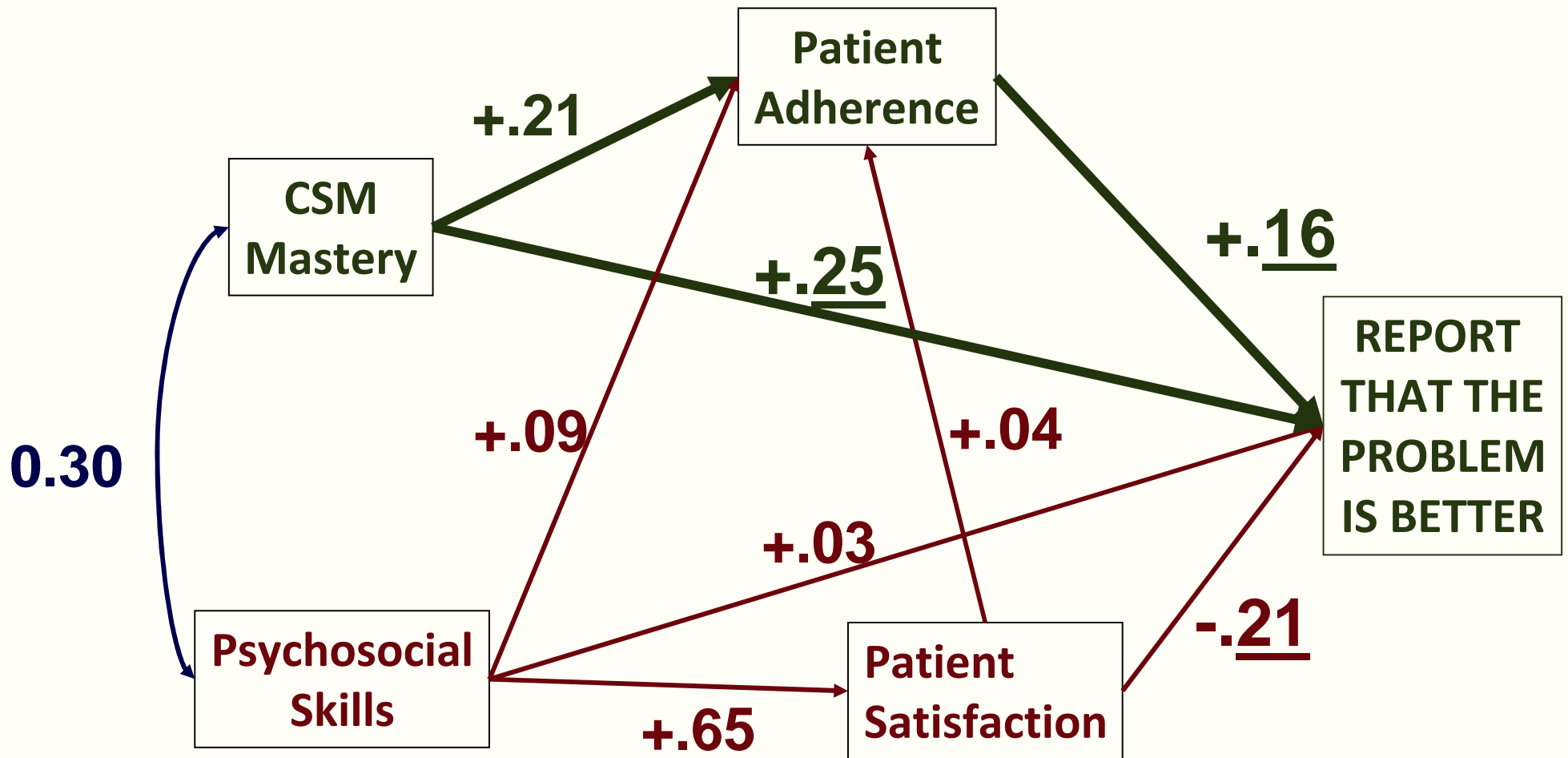
Social/Cultural Context?

Can Clinician's Address the Patient's Performance World

1: Speak to the Procedural/Action System?

2: Demonstrate Performances for Control?

Can Practitioner's Speak to the Procedural/Action System?



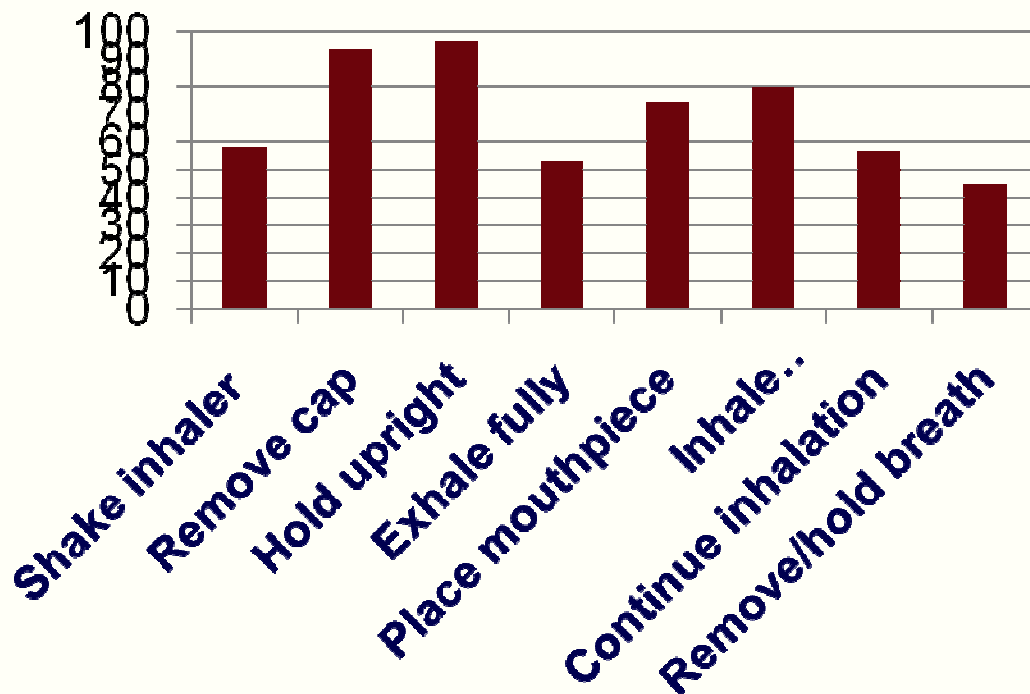
Fit Indices: Chi-Sq = 3.47 (df=1), RMSEA = .147, NFI = .96, NNFI = .72, CFI = .97, GFI = .99, AGFI = .82

Phillips, L.A., Leventhal, H., & Leventhal, E.A. (In Review). Comparison of Theoretical Mechanisms for Efficient and Effective Attainment of Patient Adherence and Treatment Outcomes in a Primary Care Setting.

Can Clinician's Demonstrate Performances for Control?

Clinicians Demonstrating Use of Asthma Inhaler

% Correctly performing each step



Elite Basketball Players, Coaches, Novices Predicting Foul Shots

	Elite	Coaches	Novice
Uncertain	Few	Till later	Much later
Right: IN	Early	Later	Much later
Right: OUT	Early	Later	Much later
Soccer			

Aglioti, Cesari, Romani, & Urgesi (2008)
Action anticipation and motor resonance in elite
Basketball players. *Nature Neuroscience*,
9, 1109-1116

Linking Emotion/Depression & Chronic Illness

Pathways

Biological: Direct, bi-directional effects

Behavioral: Mediated, bi-directional effects

Thombs, BD, deJonge,P, Coyne,JC, Whooley,MA, Frasure-Smith,N. et al. (2008). Depression screening and patient outcomes in cardiac care. *JAMA*, 300, 2161-2171.

DeTweiler-Beddell, J., Friedman, M, Leventhal, H, Miller, I, Leventhal, E (2008). Integrating co[-morbidity depression and chronic disease management. *Clinical Psychology Review*.

The end is just the beginning!

**Surely, reality is what we think it is; reality is revealed
to us by our experiences.**

**The overarching lesson that has emerged from scientific inquiry
over the last century is that human experience is often a
misleading guide to the true nature of reality.**

Greene, B. The fabric of the cosmos. Knopf, 2004, pg 5.

There is nothing so practical as a good theory.

Kurt Lewin, 1930's

Thanks to A. Kuznecov; Julian Musulino, Jacob Feldman, E. L., and our Center

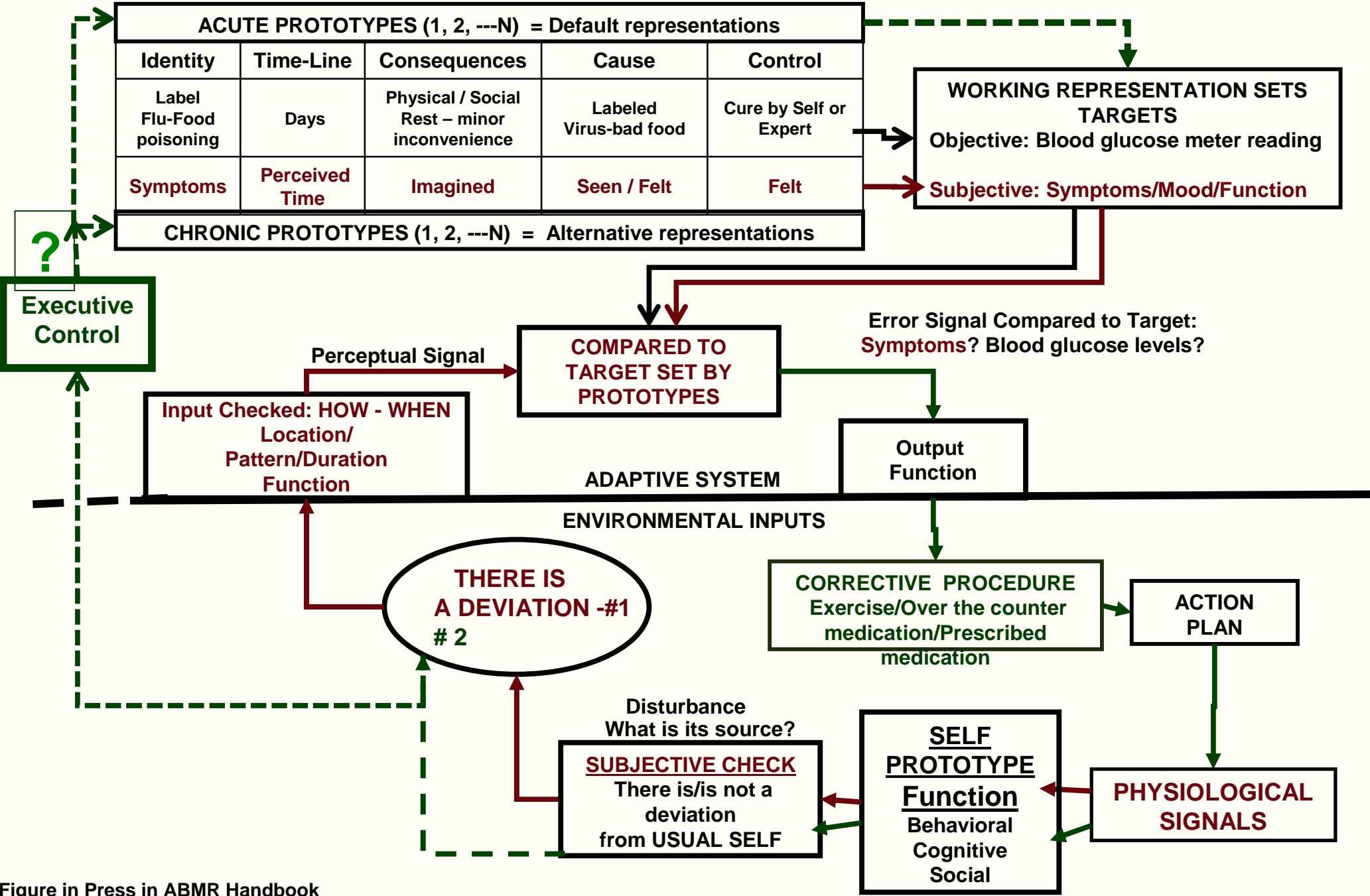


Figure in Press in ABMR Handbook

