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Harnessing Empathy

A Medication Adherence Technology Based on Social Neuroscience Research

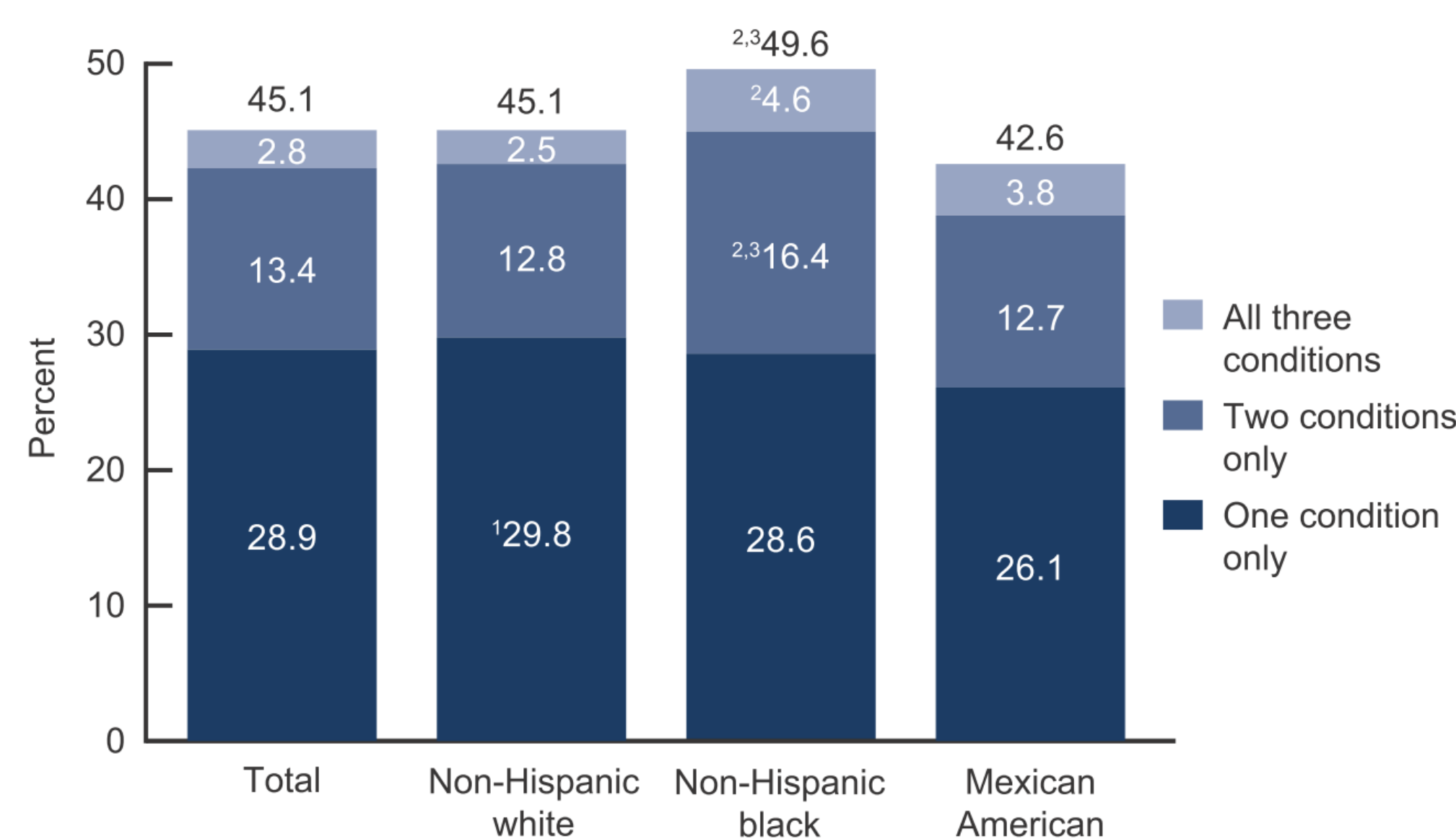
Daniel Z. Lieberman, MD, George Washington University, Department of Psychiatry and Behavioral Sciences

Problem: One half of patients with chronic illness do not take their medication as prescribed. Nonadherence leads to catastrophic medical events, permanent disability, and \$100 billion in healthcare costs each year.

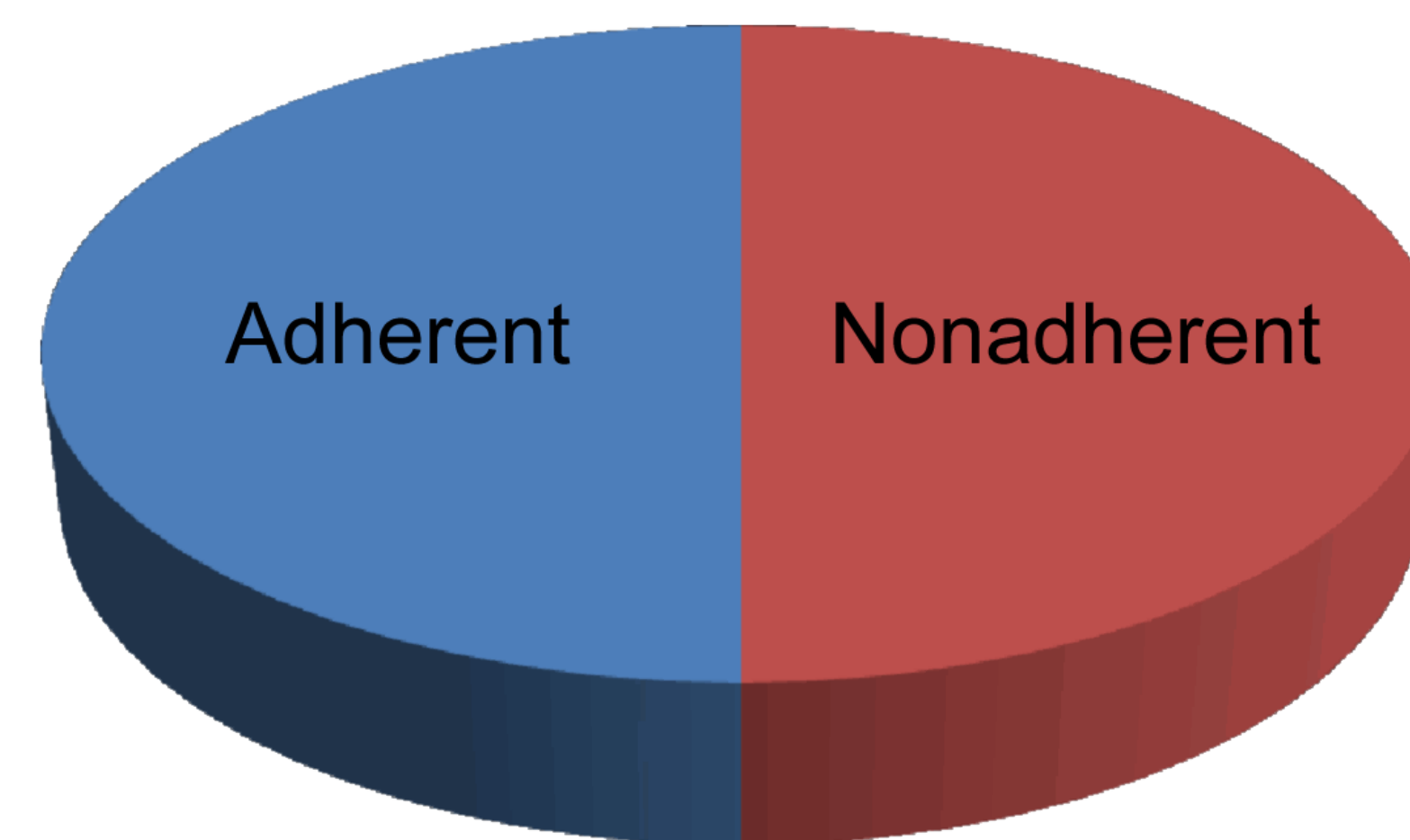
Solution: A medication adherence technology that connects taking medicine to the well-being of another person. The technology is based on social neuroscience research that points to empathy and guilt as effective modifiers of behavior.

Nearly 50% of Americans suffer from a chronic illness — **BUT** — Only half take the medication their doctors prescribe

Prevalence of hypertension, hypercholesterolemia, and diabetes in adults



SOURCE: CDC/NCHS, National Health and Nutrition Examination Surveys, 1999–2006.



Annual Cost of Prescription Medication Nonadherence

\$100 billion Cost to the U.S. healthcare system annually

\$47 billion Cost of hospitalization

\$30 billion Lost pharmaceutical sales

\$8 billion Lost pharmacy sales

\$2,000 Per patient cost in additional physician visits

40% Nursing home admissions due to nonadherence

Source: Enhancing Prescription Medicine Adherence: A National Action Plan, National Council on Patient Information and Education

“Effective ways to help people follow medical treatments could have far larger effects on health than any treatment itself.”

- The Cochrane Collaboration, Interventions For Enhancing Medication Adherence

The Science. How can behavior be changed?

Neuroeconomics: Consequences must be immediate, concrete, and emotional.

Social Neuroscience: Relationships have the most potent effects on the motivating centers of the brain that trigger reward (satisfaction) and punishment (guilt).

The Technology. The emotional state of a “reacting individual” is contingent on adherence.

The reacting individual can be a loved one, a pet or licensed character for children, an avatar, or an actual impoverished child who receives aid contingent upon adherence.



Child or grandchild



Virtual pet



Customized avatar

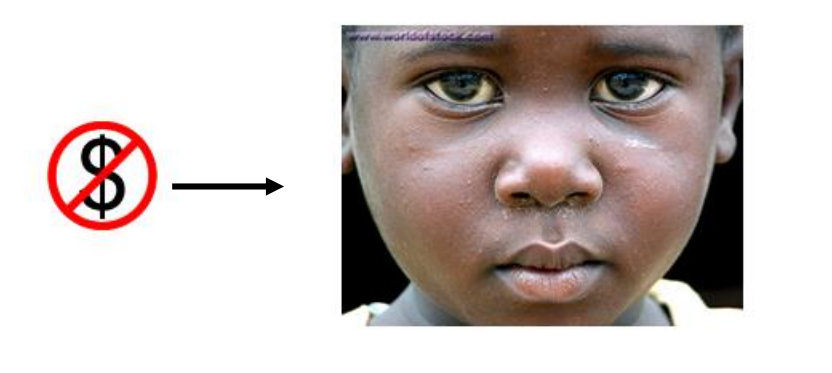


“Compassion Technology” - Real world consequences

Donation... \$



Adherence



Nonadherence

A donation is made to a charity that supports children. On each day of medication adherence, a portion of the money is committed to the charity. On days of nonadherence the money is lost.

Selected Research

“Is social attachment an addictive disorder? There is a considerable literature on the neurobiology of reward, based largely on studies of addiction or substance abuse. This review considers the possibility that the neural circuits that mediate reward evolved for ethologically relevant cues, such as social attachment.”
Thomas Insel (former Director of the National Institute of Mental Health) Is social attachment an addictive disorder? Physiology and Behavior 2003;79:351-357.

“The Social Brain Hypothesis: The evolution of unusually large brains in humans and other primates was driven by the need to develop intense social bonds within complex societies. Relationships and cooperation provide the key to fitness benefits at the group level.”
Dunbar RIM and Shultz S. Evolution in the social brain. Science 2007;317:1344-1347.

“There are many examples to show that people will work more for a cause than for cash. A few years ago, for instance, the AARP asked some lawyers if they would offer less expensive services to needy retirees, at something like \$30 an hour. The lawyers said no. Then the program manager from AARP had a brilliant idea: he asked the lawyers if they would offer free services to needy retirees. Overwhelmingly, the lawyers said yes.”
Predictably Irrational: The Hidden Forces That Shape Our Decisions, by Dan Ariely, James B. Duke Professor of Psychology and Behavioral Economics, Duke University.

“Detection of suffering in another individual strongly correlates with activation in the amygdala (the alarm/anxiety producing structure in the brain). Additionally, self-reports of compassion toward sad faces predicted greater activation in dopaminergic reward signaling areas (substantia nigra and ventral tegmental area). This finding provides preliminary evidence that there is an intrinsic reward to compassion, one that could help outweigh any costs or risks perceived in helping behavior.”
Goetz JL, et al. Compassion: an evolutionary analysis and empirical review. Psychological Bulletin 2010;136(3)351-374

“Further evidence that decisions involving social preferences are associated with activity in reward circuitry comes from fMRI studies of charitable donations. Decisions to donate whether costly or not, activate the subgenual area, a region densely connected with mesolimbic, dopaminergic, and serotonergic pathways.”
Neuroeconomics: Decision Making and the Brain by Ernest Fehr, Institute for Empirical Research in Economics, University of Zurich