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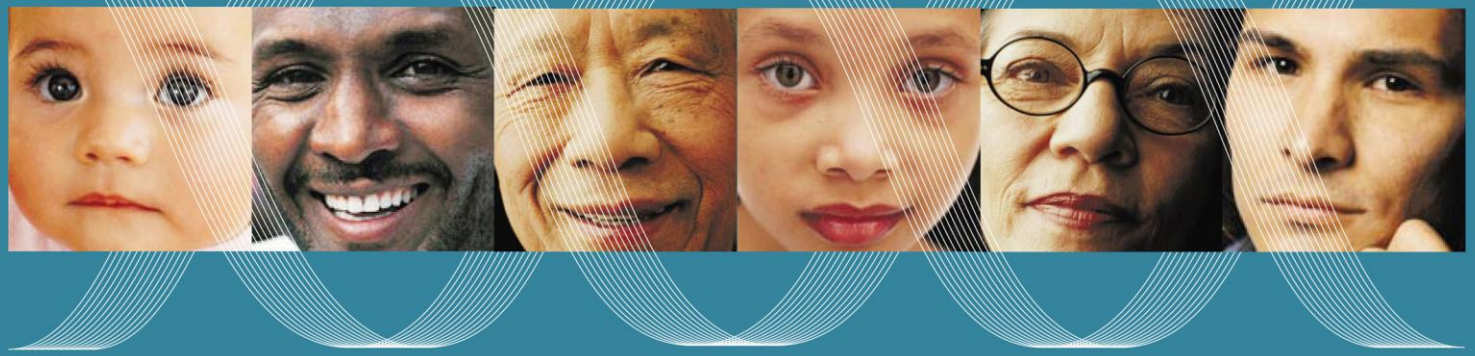


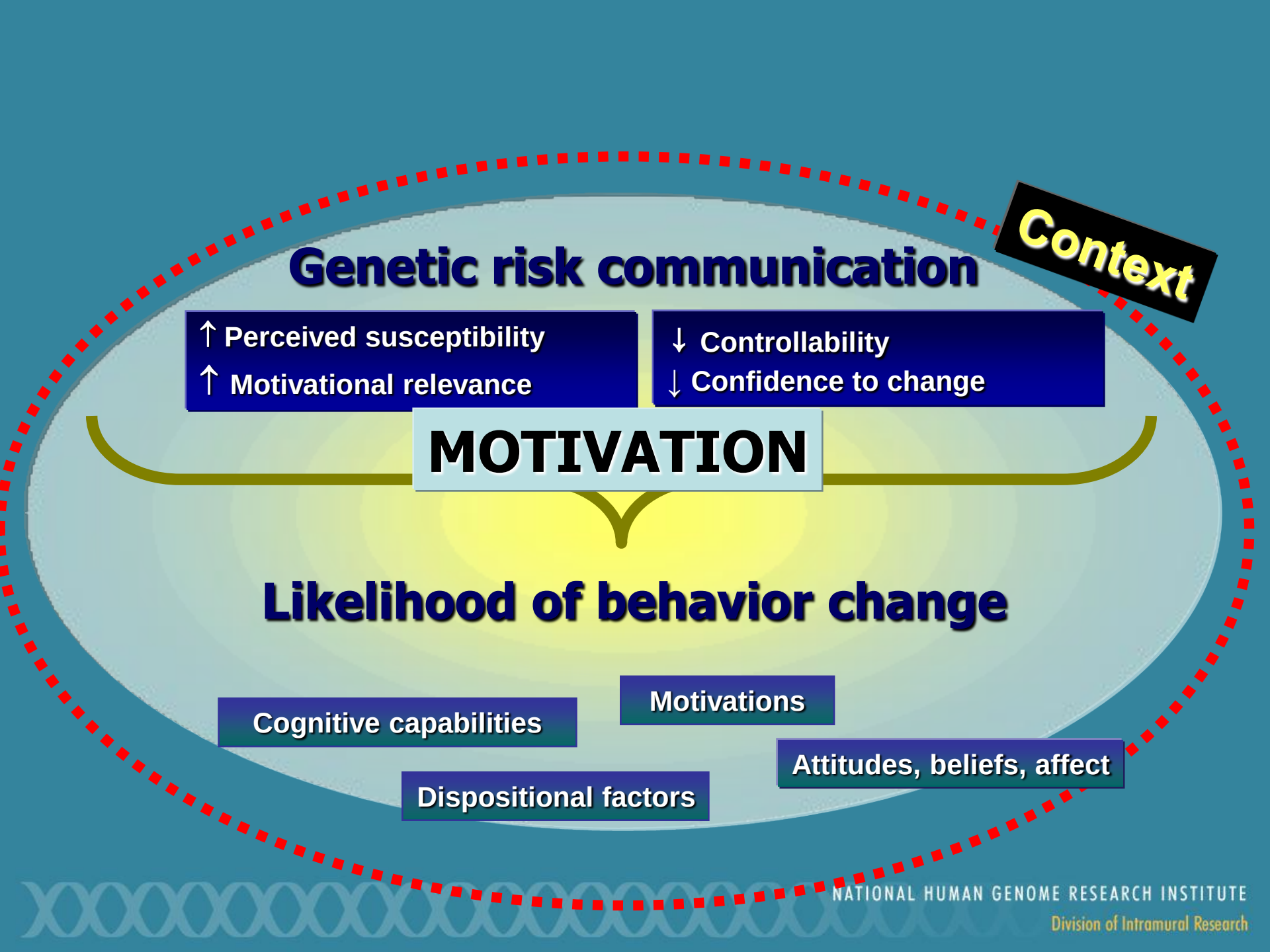
Does Genetic Information Change Behavior?

Colleen M. McBride, Ph.D.
Social & Behavioral Research Branch

Workshop on Personal Genetics
December 17, 2008

Today's talk: 3 Points!

- Answer unknown…
  - Assumption, "If you tell them and they understand, they will do it"
- Think deeper…
  - Mechanisms & behavioral outcomes
- New horizons in personalization
  - New intervention targets?


Context
Genetic risk communication
↑ Perceived susceptibility
↑ Motivational relevance
↓ Controllability
↓ Confidence to change
MOTIVATION
Likelihood of behavior change
Cognitive capabilities
Motivations
Attitudes, beliefs, affect
Dispositional factors
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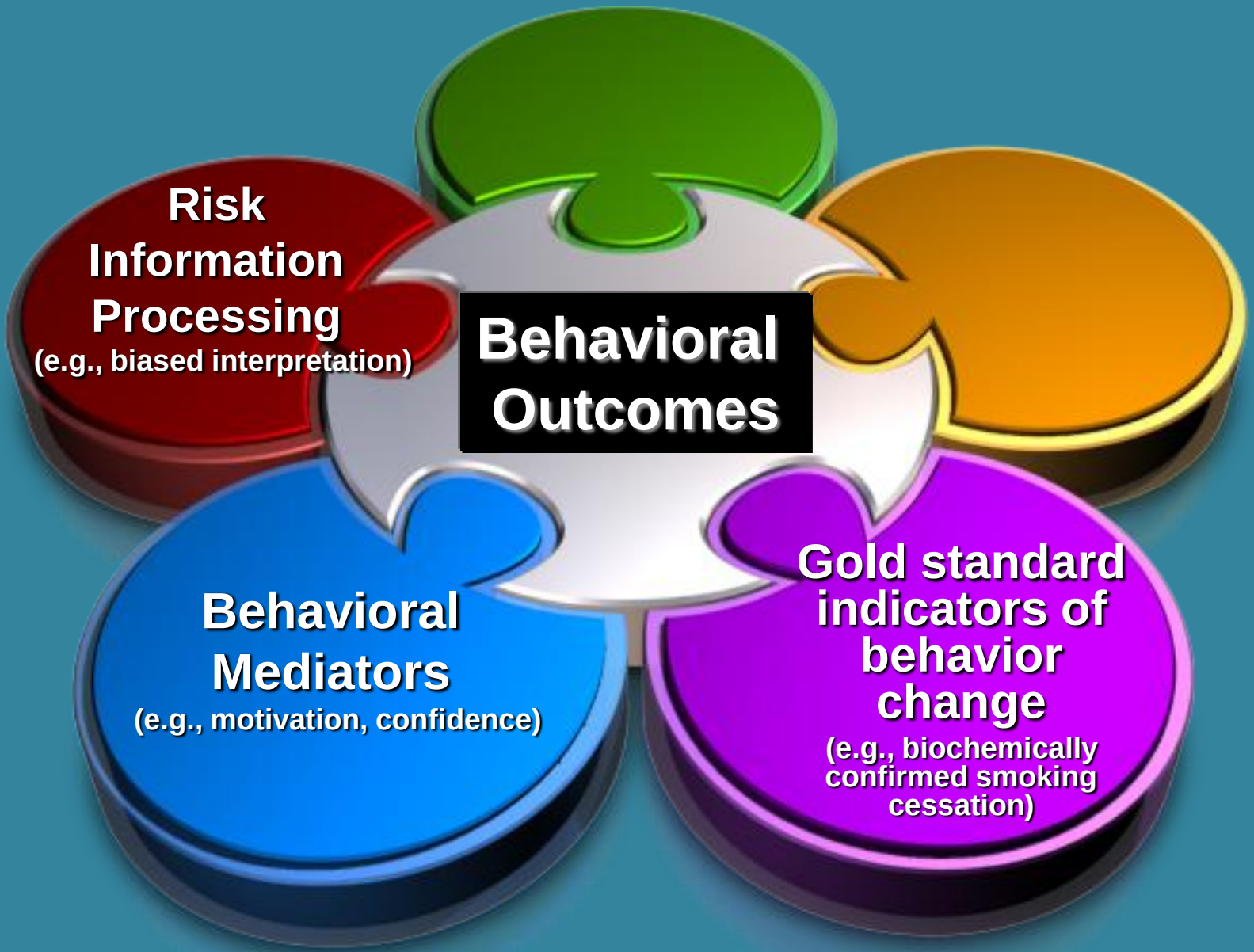
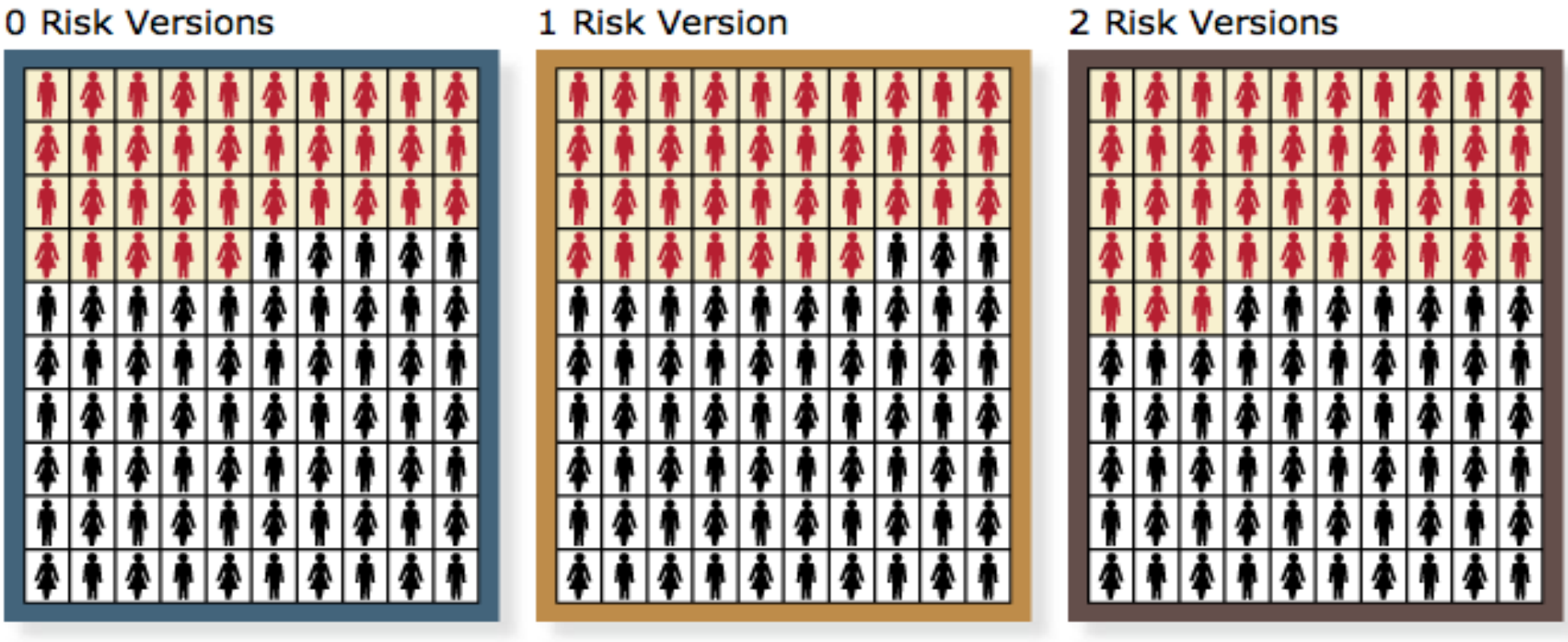

Risk Information Processing
(e.g., biased interpretation)
Behavioral Outcomes
Behavioral Mediators
(e.g., motivation, confidence)
Gold standard indicators of behavior change
(e.g., biochemically confirmed smoking cessation)

What is someone's chance of getting diabetes in their lifetime if they have any KCNJ11 risk versions?

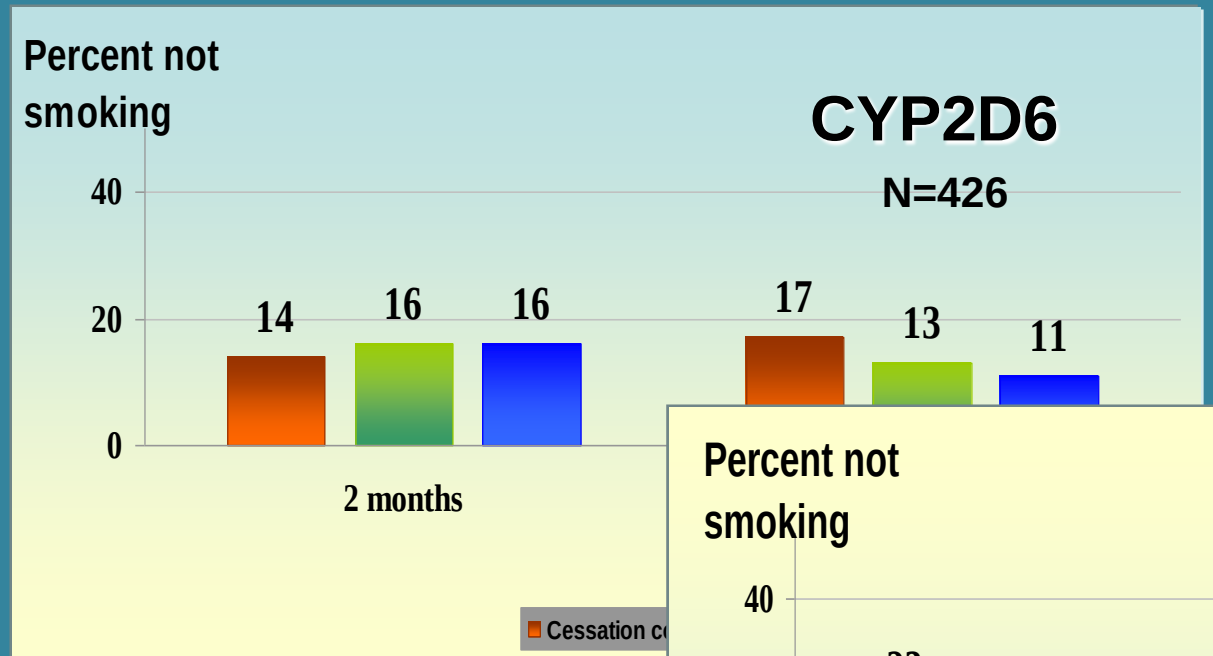
- People who have **no risk versions** of KCNJ11 will have, on average, a 35 in 100 chance of getting diabetes.
- People who have **1 risk version** of KCNJ11 will have, on average, a 37 in 100 chance of getting diabetes.
- People who have **2 risk versions** of KCNJ11 will have, on average, a 43 in 100 chance of getting diabetes.

Chance of getting diabetes based on the number of risk versions of KCNJ11
(Out of 100 people. People with diabetes are shown in red.)

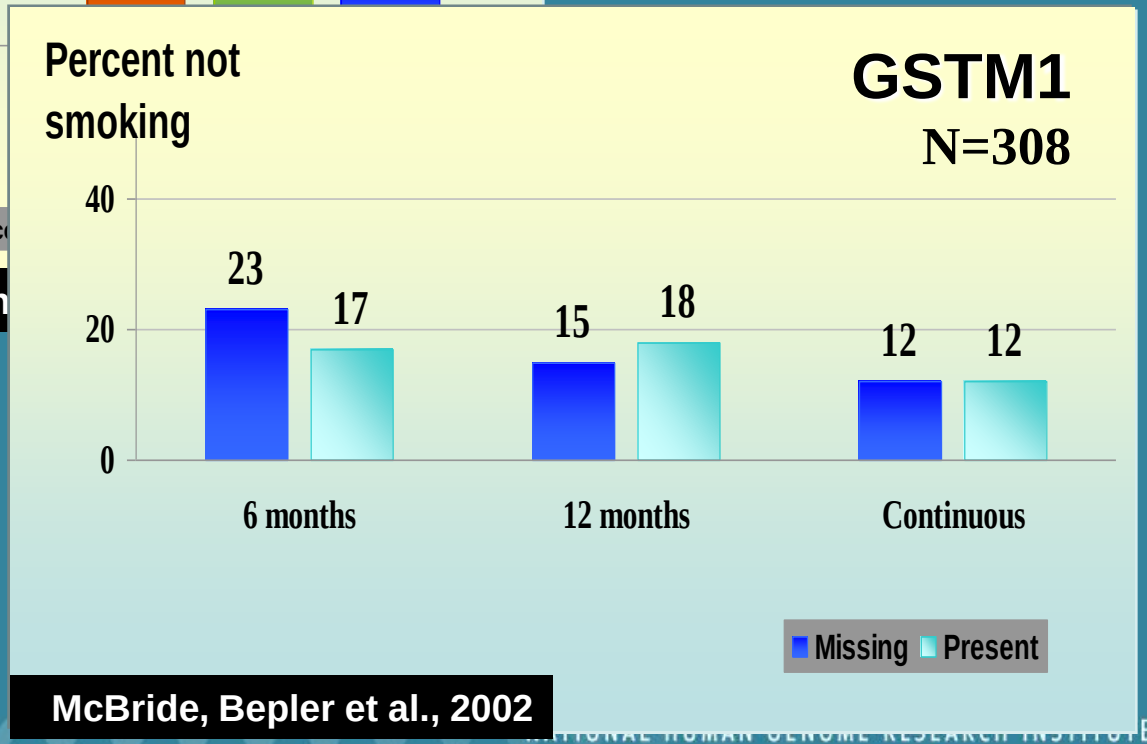


1990's Clinical Trials:

Genetic feedback effects on smoking cessation



Lerman et al., 1997; Audrain



McBride, Bepler et al., 2002

Welcome to the
FAMILY RISK AND LUNG CANCER STUDY

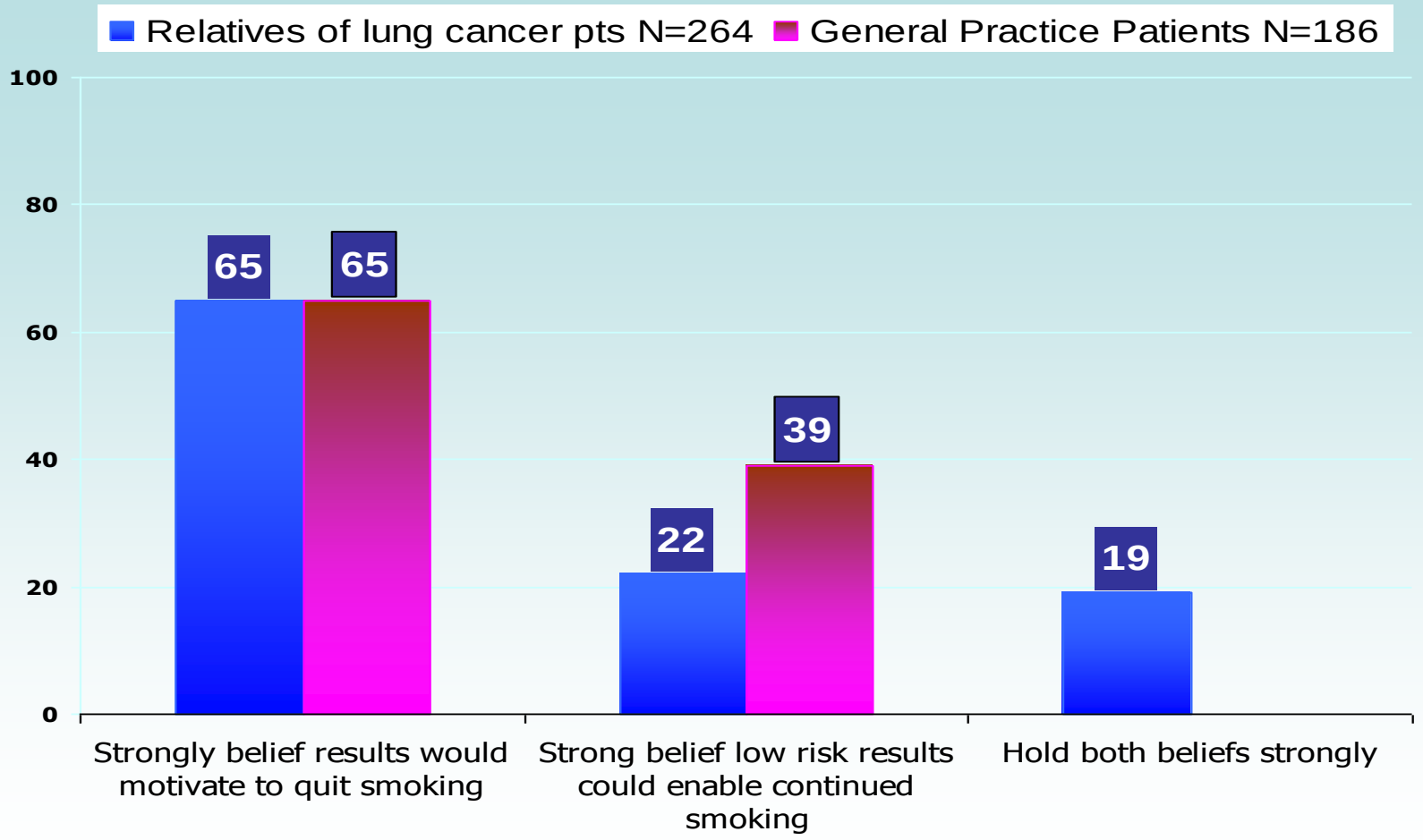
Thank you for Participating!

Contextual & practical questions:

- Which smokers are interested in genetic testing for lung cancer susceptibility (GSTM1)?
- How does the test result affect cognitive factors associated with smoking cessation?

NEXT

Smokers' attitudes about hypothetical genetic testing



Sanderson et al., under review
Sanderson & Wardle, Health Educ & Beh, 2005
Sanderson, Wardle et al., 2004

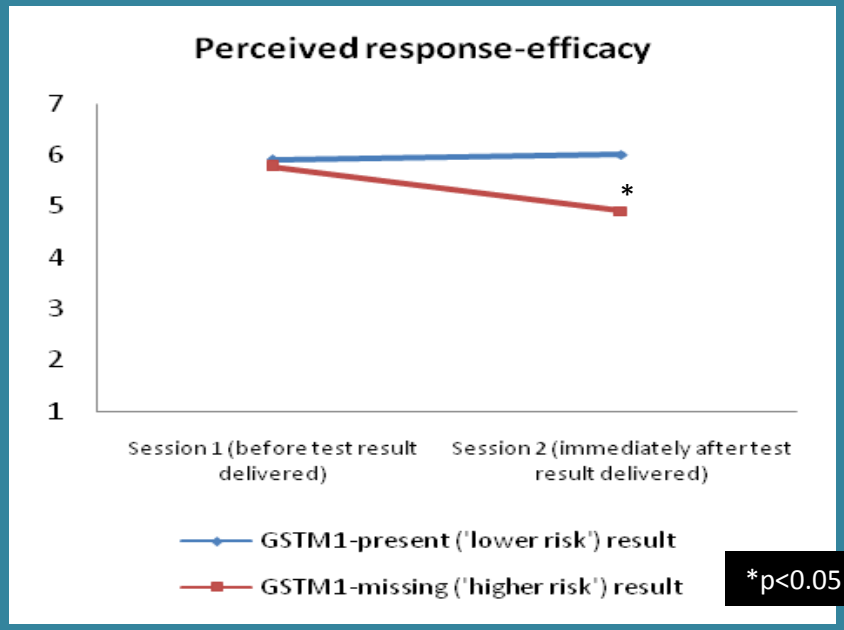
Which smokers were interested in genetic testing?

Demographics	Logged on (n = 58)	Did not log on (n = 58)	Sig.
Gender (% female)	59%	48%	NS
Mean Age (yrs)	40.1 (8.3)	36.5 (10.5)	<0.05
Education			
High school or less	28%	36%	NS
Technical degree / some college	50%	41%	
College degree	22%	23%	
Unemployed	14%	14%	NS
Non-Hispanic white	96%	96%	NS
Daily internet use	85%	62%	<0.05
Aware of cancer genetic testing	61%	42%	<0.05
Motivation to quit smoking[1]	**6.3 (1.1)**	**5.6 (1.7)**	**<0.01**
Closeness to patient[1]	5.5 (1.1)	5.2 (1.1)	NS

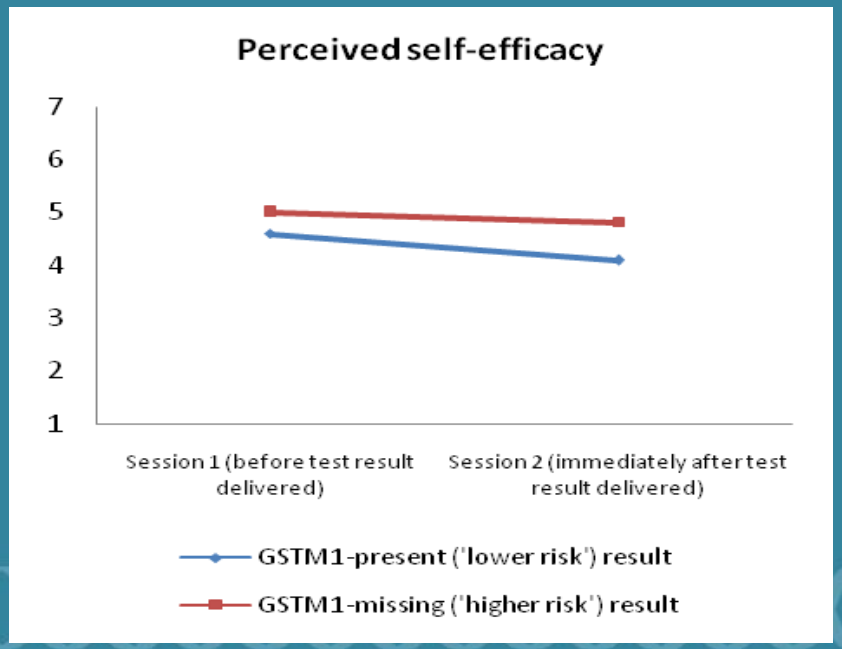
[1]1-7 scale

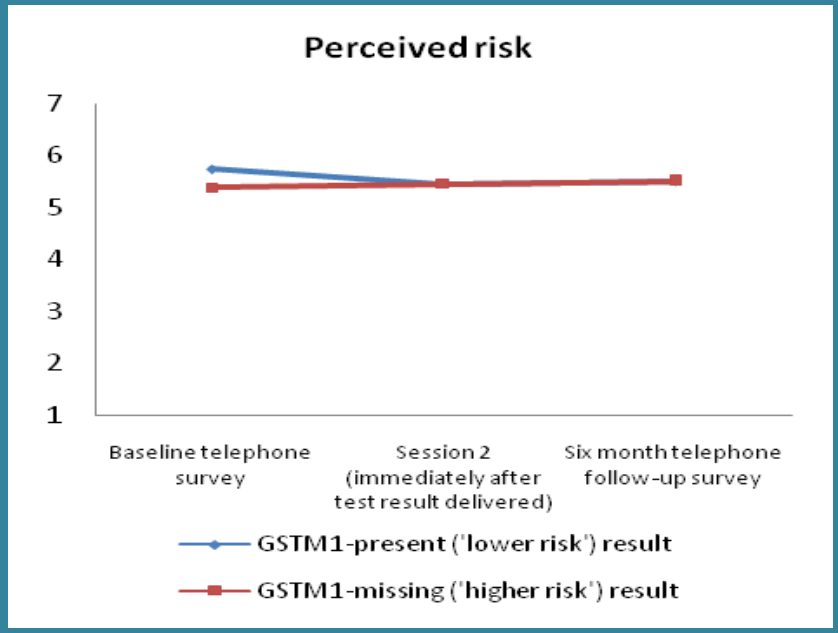
O'Neill et al., Genetics in Medicine, 2008

Response to test results



*p<0.05



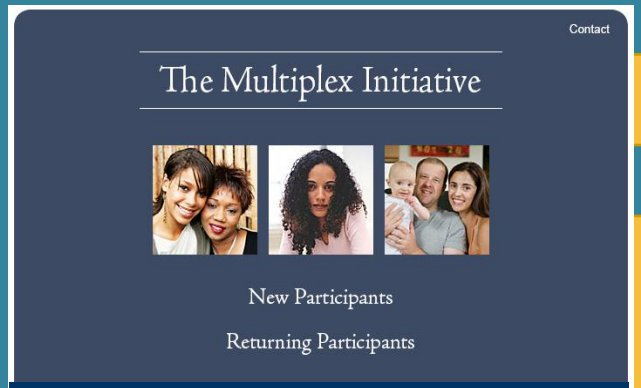


Sanderson et al, CEBP in press

Confidence about managing weight by mutation status

Obese Women (N=30)

Harvey-Berino et al., 2001



Partners:
NHGRI
Henry Ford Health System, Detroit
Group Health Cooperative, Seattle

Study Design

Baseline screening survey

↓

Mail invitation to website
to consider genetic testing

↓

Web-based
decision process re: testing
w/financial incentives

↓

Consent process
In-clinic blood draw

↓

Test feedback provi
directly to subjec
by mail + telephone fol

↓

3 month follow-up telephone survey

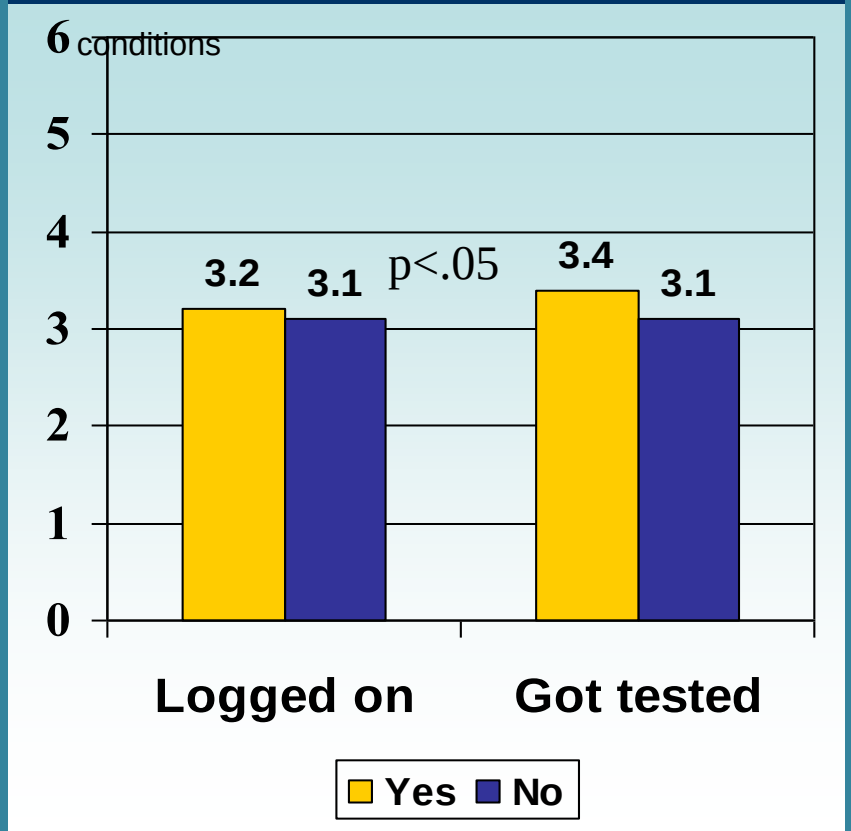
Behavioral Outcomes

- **Seek Surgeon General's Family Hx Assessment**
- **Seek Harvard Behavioral Risk Factor Assessment**
- **Talk to Doctor**

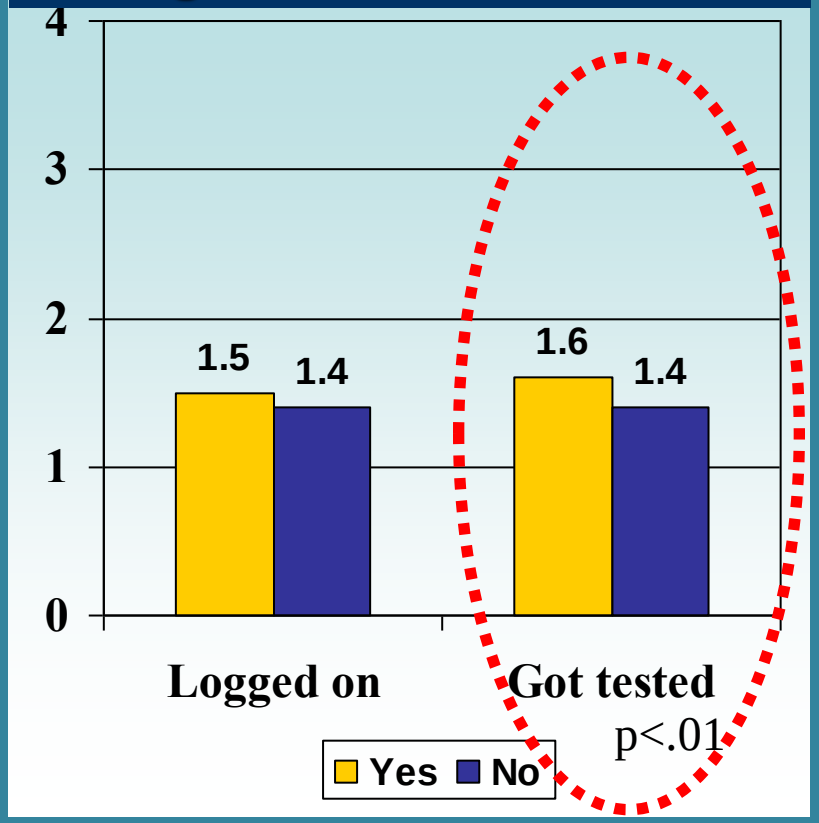
McBride, Alford, Reid, Larson, Baxevanis, Brody, Nature Genetics, 2008

What prompts individuals to seek genetic information?

Family history



Mean health habits want to change



N=1959 surveyed, & 612 logged on

New Horizons in Personalization

	Marker	Function
Type 2 Diabetes	PPAR gamma KCNJ11 TCF7L2	Fat cell development
Myeloid leukemia	CYP1A1 CYP1B1	Phase I enzymes activating environmental carcinogens

Stronger risk messages

> 400 genes involved in obesity

- Adipocyte growth & differentiation
- Energy expenditure
- Individual response to caloric restriction
- Appetite control

Enabling interventions to be individualized to physiology

Randomized controlled trial of four commercial weight loss programmes in the UK

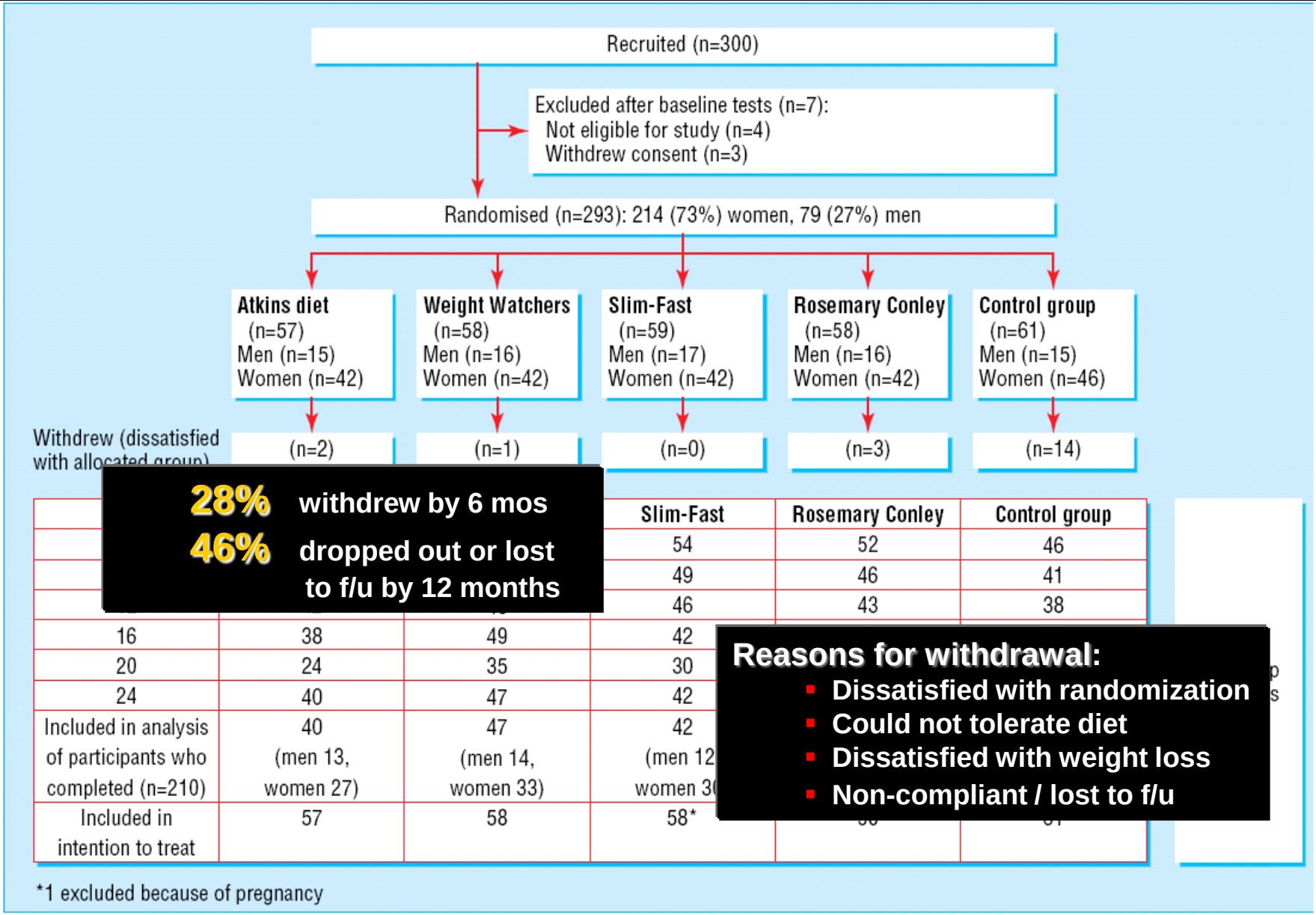


Fig 1 Flow of participants through the BBC diet trials

Truby et al, BMJ, 2006

International Journal of Obesity (2003) 27, 1028–1036

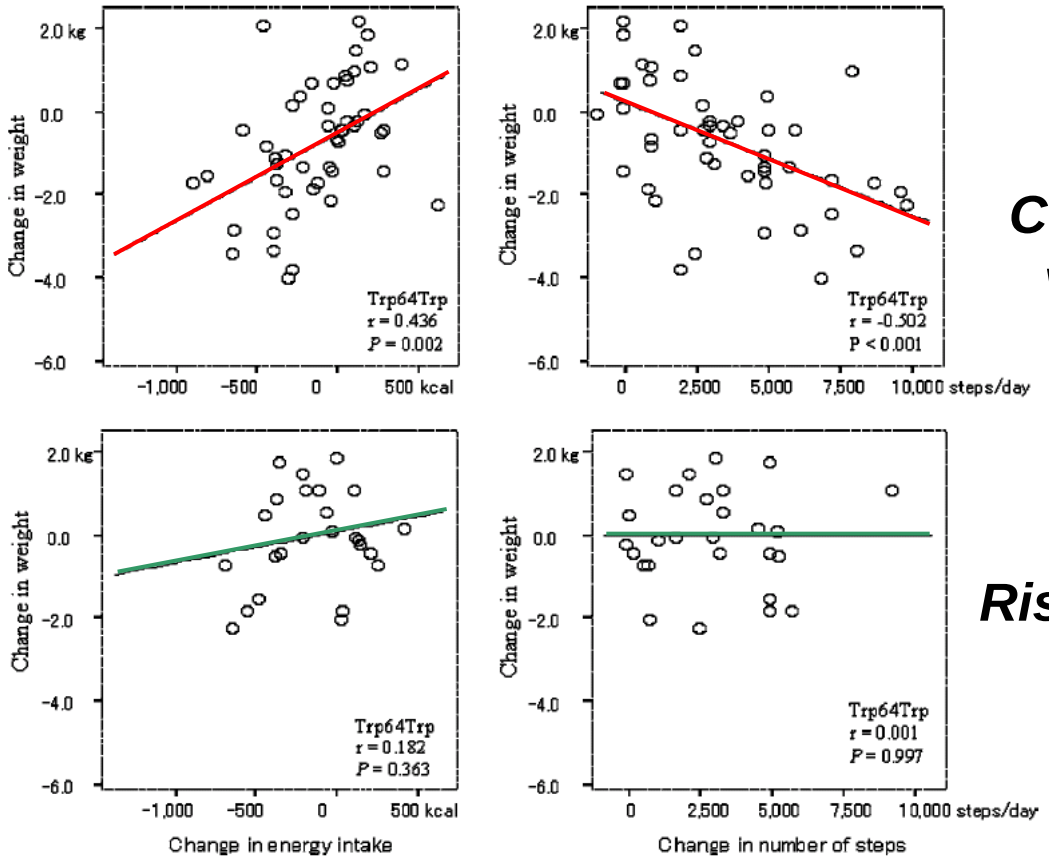
0307-0565/03 $25.00
www.nature.com/ijo

PAPER

Difficulty in losing weight by behavioral intervention for women with Trp64Arg polymorphism of the β_3-adrenergic receptor gene

K Shiwaku[1]*, A Nogi[1], E Anuurad[1], K Kitajima[1], B Enkhmaa[1], K Shimono[1] and Y Yamane[1]

[1]Department of Environmental Medicine, Shimane Medical University, Izumo City, Shimane, Japan



Common variant

Risk variant

Figure 1 Correlation between weight loss and changes in energy intake or number of steps Pearson's correlation coefficients associated with weight loss and *P* values were expressed.

A Transdisciplinary Model Integrating Genetic, Physiological, and Psychological Correlates of Voluntary Exercise

Bryan, Hutchison, Seals, Allen, 2007

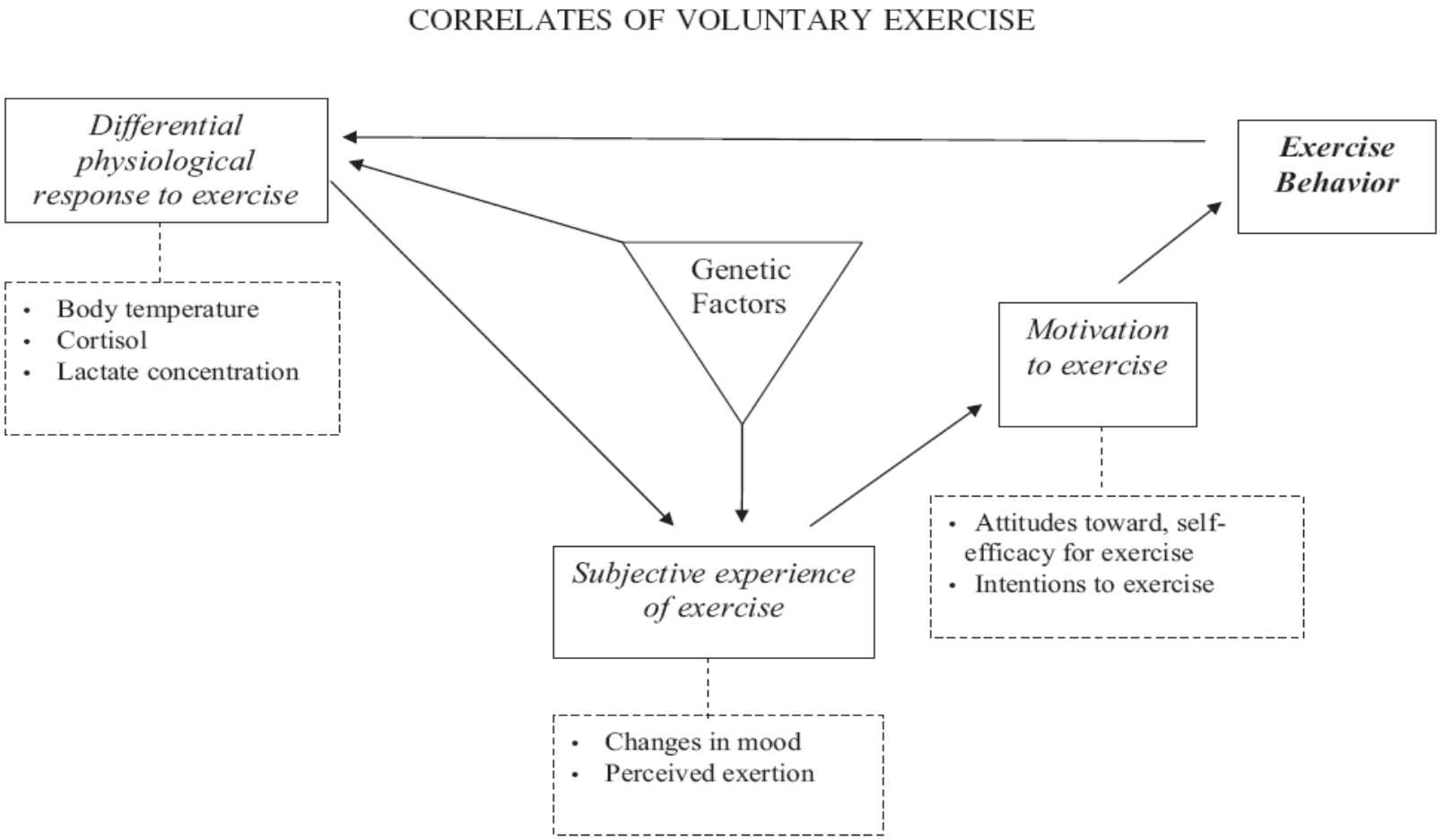
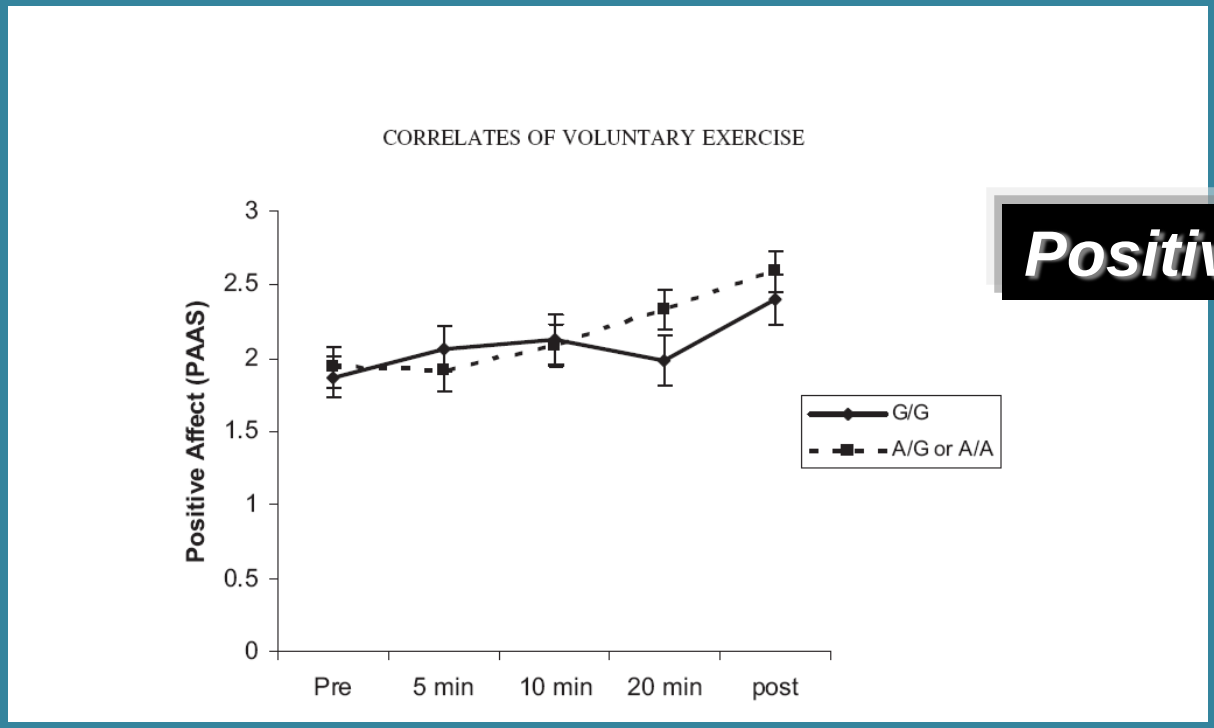
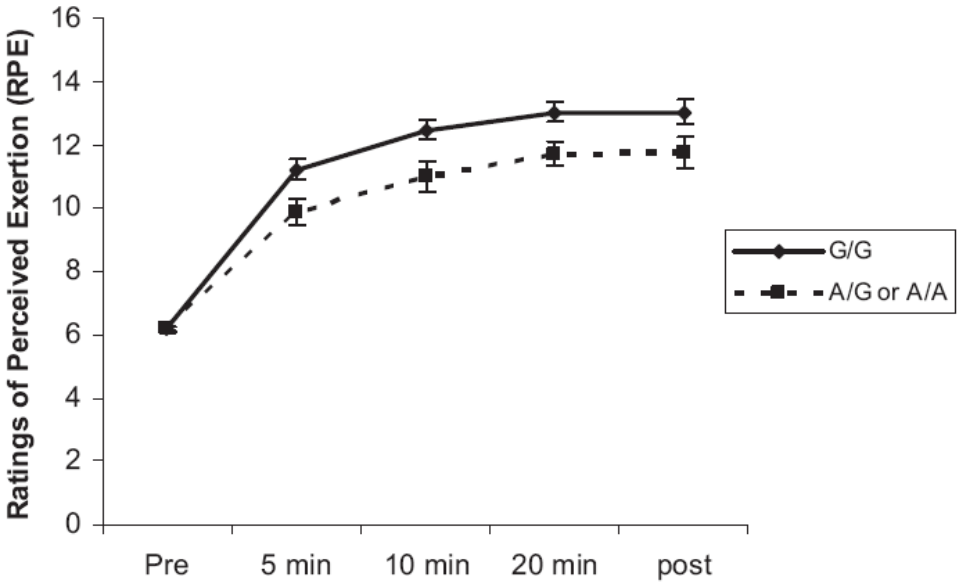


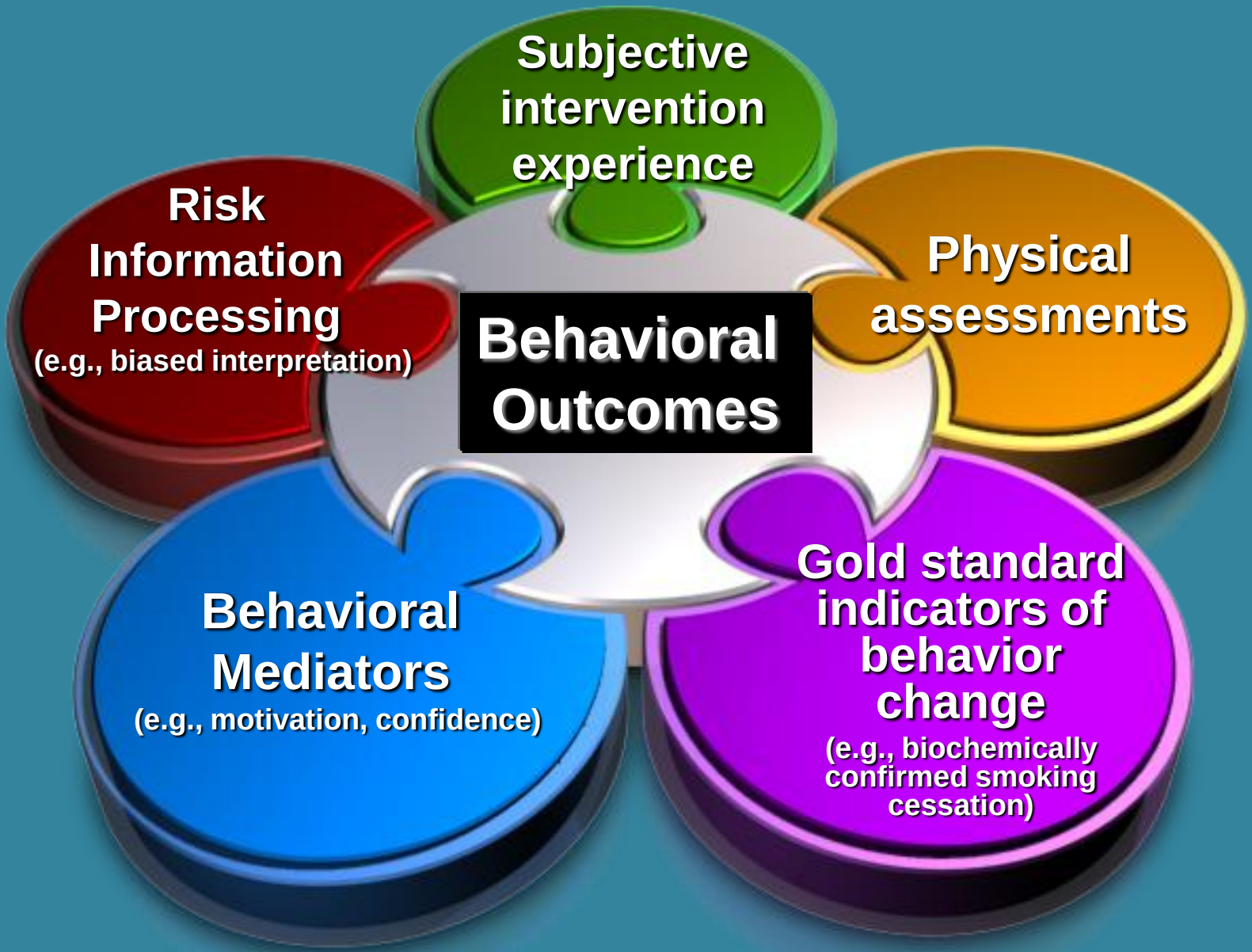
Figure 1. Transdisciplinary model of exercise behavior.

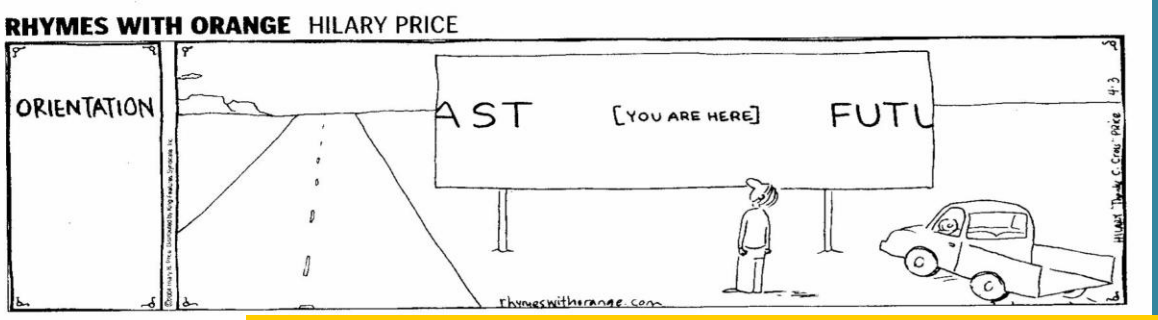


Positive Affect

Perceived Exertion




Subjective intervention experience
Risk Information Processing
(e.g., biased interpretation)
Physical assessments
Behavioral Outcomes
Behavioral Mediators
(e.g., motivation, confidence)
Gold standard indicators of behavior change
(e.g., biochemically confirmed smoking cessation)



Where do we go from here….

- **Set priorities for behavioral research & genomics**
  - Apply models like REAIM to develop phased research plan
  - Conceptually based research questions
- **Anticipate direction of genomic discovery**
  - Move beyond psychological effects of genetic risk communication
- **“Deconstruct” behavioral phenotypes**
  - Measure intermediate pathways of influence that might affect behavioral adherence
  - Move to a bi-directional influence models (e.g., systems thinking)

Acknowledgements

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- Christopher Wade, Ph.D.