Internet-based personalized cancer risk assessment tools: Opportunities and pitfalls

Erika A. Waters, PhD, MPH
Department of Surgery
Division of Public Health Sciences

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Washington University in St. Louis
School of Medicine

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Agenda

What is risk and what are risk perceptions?

Evaluating the efficacy of an existing tool

Expanding to a wellness-oriented approach

Bridging the intention-behavior gap

Conclusion

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Translation is critical but difficult

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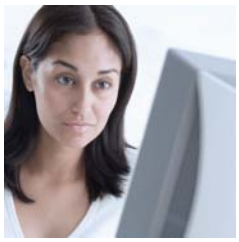
What is risk?



Objective
RR
RRR
odds
OR
HR
NNT
NNH
AR
ARR
Attributable risk

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What is risk?

Subjective
Danger
Hazard
Uncertainty
Certainty
All-or-nothing
Frightening
Severe

Han et al, *Health Expectations*, 2009
Holmberg, *Health, Risk & Society*, 2010
Reyna, *Medical Decision Making*, 2008
Slovic, *The Perception of Risk*, 2000

What is risk?

Delayed	Chronic	Painful	Disabling
Disfiguring	Unfamiliar	Progressive	Fatal
Acute	Imminent	Infectious	Uncertain
Localized	Stigma	Visible	Known cause
New	Random	Symptomatic	Probability

Slovic, *The Perception of Risk*, 2000
Weinstein, *Society of Behavioral Medicine*, 2003

The challenge

Objective
RR
RRR
odds
OR
HR
NNT
NNH
AR
ARR
Attributable risk

→

Subjective
Danger
Hazard
Uncertainty
Certainty
All-or-nothing
Frightening

→ Action

What does it mean and what should I do?

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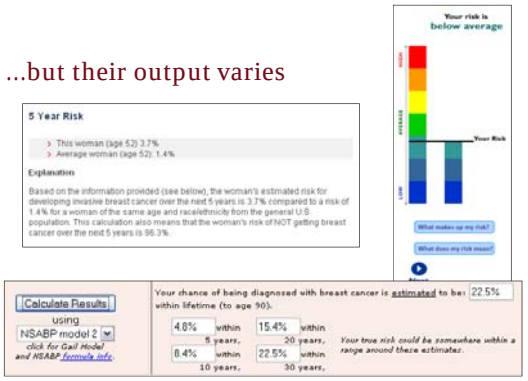
Internet-based cancer risk assessment tools

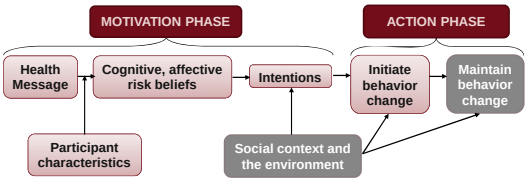
Waters et al., *Journal of Medical Internet Research*, 2009
www.yourdiseaserisk.wustl.edu
www.cancer.gov/bcrisktool/
http://www.chiprehab.com/CVD/index.php
www.halls.md/breast/risk.htm

...but their output varies



French et al., *Annals of Behavioral Medicine*, 2017

Health behavior change is a process that occurs in phases over time



Adapted from: Waters et al., *Handbook of Health Communication, Behavior Change, and Treatment Adherence*, 2013
Schwarzer, *Current Directions in Psychological Science*, 2001

Study aim

What is the effect of a personalized breast cancer risk assessment tool on key cognitive and affective precursors of physical activity, when optimal risk communication strategies are used?

Provide graph, risk reduction information, and tips for reducing risk, but no numbers.

Fowler et al., *Medical Decision Making*, 2017
Waters et al., *Journal of Medical Internet Research*, 2009
Zikmund-Fisher et al., *Med Care Res Rev*, 2013

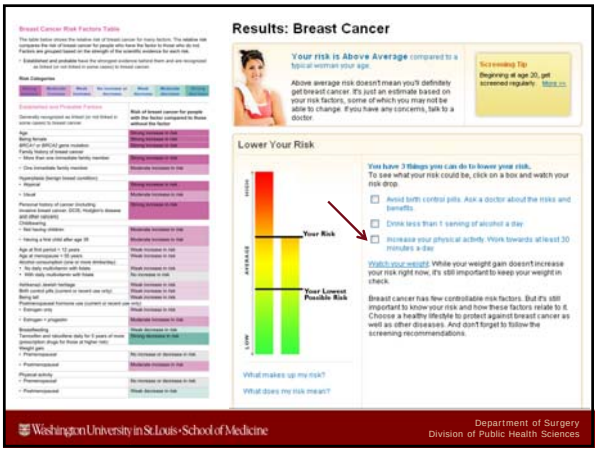
Study design

2-arm pilot RCT with 1 month follow-up

N=132 women with no prior cancer history

Recruited via registry and community advertisements

Fowler et al., *Medical Decision Making*, 2017



Results—Participant characteristics

Participant characteristic	n	%
Educational attainment		
Less than high school	1	0.8
High school degree	41	31.1
Associate's or technical degree	13	9.8
Some college	**38**	**28.8**
Bachelor's degree	**17**	**12.9**
Master's or doctorate degree	**21**	**15.9**
Missing	1	0.8
Race		
Non-Hisp White	**98**	**74.2**
Non-White	34	25.8
Age	**55.8**	**9.1**

Participant characteristic	n	%
Objective risk (personalized condition only)		
Very much below average	0	0.0
Much below average	1	2.3
Below average	16	27.3
Average	7	13.6
Above average	**33**	**47.7**
Much above average	**5**	**9.1**
Very much above average	**0**	**0.0**

Results—Main hypotheses

Outcome			Non-personalized (n=66)		Personalized (n=59)	
	F	p	Mean	SE	Mean	SE
Intentions	11.5	0.001	4.0	0.1	4.5	0.1
Self-efficacy	5.2	0.02	3.4	0.1	3.8	0.1
Response efficacy	7.2	0.01	3.5	0.1	3.9	0.1

Covariates included: education, race/ethnicity, family history of breast cancer, and stage of physical activity (i.e., "I already [engage in the recommended amount of activity]" v. all others).

Results—Main hypotheses

Outcome			Personalized condition	
	F	p	Mean	SE
Perceived risk change	15.2	.001	-	-
• Initially underestimated risk (n=31)	4.4	.001	0.7	0.2
• Initially overestimated risk (n=14)	-2.6	.02	-1.1	0.4
• Initially made accurate risk estimate (n=14)	-2.2	.05	-0.5	0.2

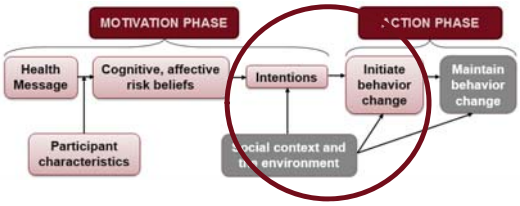
Results—Mediators of effect of condition on intentions

- Multiple mediation model
- SAS %INDIRECT
  - 5000 bootstrapped resamples with bias-corrected confidence intervals
  - Self-efficacy: b = 0.26, 95% CI = 0.05-0.51
  - Response efficacy: b = 0.07, 95% CI = 0.01-0.17
  - Perceived risk: N/A

Hayes AF. http://www.afhayes.com/spss-sas-and-mplus-macros-and-code.html.
Hayes AF, Scharkow M. Psychol Sci. 2013

Results—Behavior

OR = 0.9, 95% CI 0.4-0.9, *p* = .64



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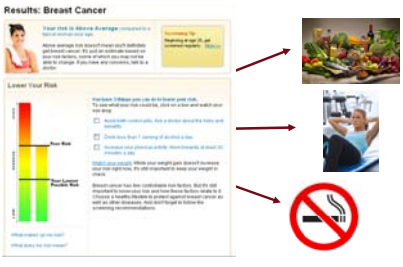
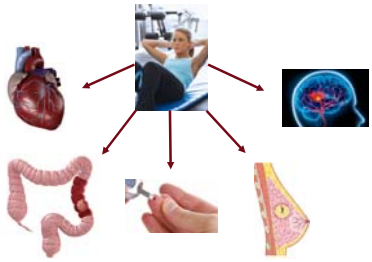
Traditional disease-focused communication



Wellness-focused communication



NCI R01 CA190391

Study aim 1

What is the best communication format for showing people personalized risk estimates for multiple diseases, as well as how behavior change can reduce risk?

Diseases:

- Colon cancer
- Breast cancer (women only)
- Diabetes
- Heart disease
- Stroke

NCI R01 CA190391

Study design

3-arm RCT with 3 month follow-up

N=489 men and women with limited chronic disease history and who obtain < 150 mins moderate intensity physical activity weekly.

50% no college experience

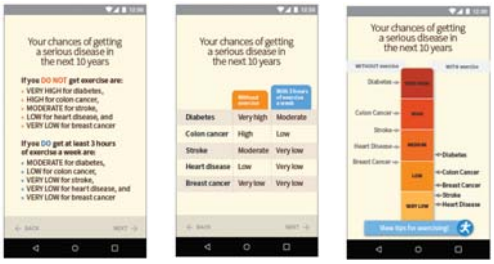
50% racial/ethnic minority background

Recruited via registry and community advertisements

Current N=148

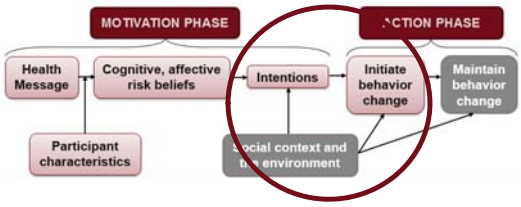
NCI R01 CA190391

Risk communication strategies



NCI R01 CA190391

Intentions-behavior gap



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Study aim 2

Use a mental imagery-based self-regulation intervention to increase physical activity behavior

NCI R01 CA190391-REVISED

Mental imagery-based self-regulation intervention with SMS cues for action

Self-regulation: The mental and physical activities that people use to "stay on track" when pursuing a goal

- Strategic planning is key: what, when, where, how
- When I get home, I will walk the dog around the park for 20 minutes.

Schwarzer, *Current Directions in Psychological Science*, 2001

Mental imagery-based self-regulation intervention with SMS cues for action

Mental simulation and imagery: prepare the mind for pursuing goals.

- Helps identify cues for action, potential challenging situations, and strategies to overcome barriers.
- Lessens contextual and environmental impacts
- Used in sports
- When I get home, I will walk the dog. If it rains, we will wear rain coats. If it's very hot, I will bring a bottle of water and a water bowl.

Chan & Cameron, *J Behavioral Medicine*, 2012
Loft & Cameron, *Annals of Behavioral Medicine*, 2013
Schwarzer, *Current Directions in Psychological Science*, 2001
Schwarzer, *Applied Psychology*, 2008

Study design

2-arm RCT attached to the end of the risk communication study with 4 weekly follow-up surveys administered by text messaging.

Same 489 men and women as in the risk communication study

NCI R01 CA190391-REVISED

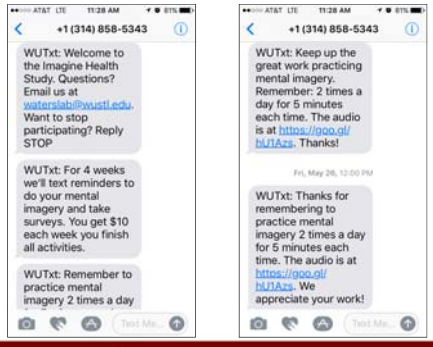
Self-regulation audiorecording

NCI R01 CA190391-REVISED

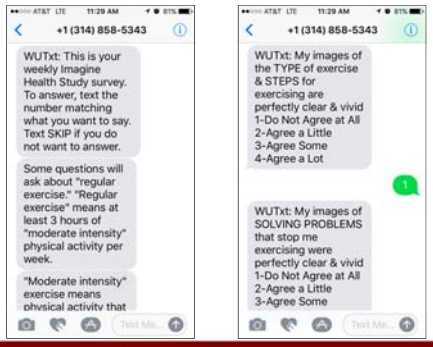
Pocket goal card

R01 CA190391-REVISED

Text message component



Text message survey



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Erika A. Waters
waterse@wustl.edu