Research to Action:

Leveraging Information Technologies for Population-Wide Physical Activity Promotion

Abby C. King, PhD

Stanford Healthy Aging Research & Technology Solutions Lab

Stanford Prevention Research Center

Stanford University School of Medicine

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(Disclosures: Amway/Nutrilite; Google; Gen-9)

Presentation Objectives

- Discuss some current trends in information technology (IT) of particular promise for physical activity promotion

- Highlight some *future directions* in the field

(Disclosures: Google, Gen-9, Amway/Nutrilite)

The *CHALLENGE*

- **Technology** = major "driver" of many of society's comforts, conveniences & advances

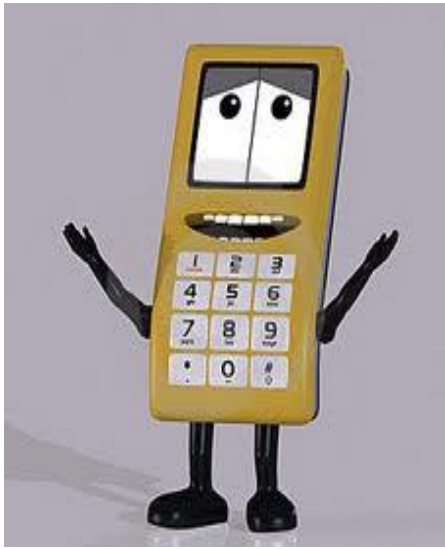
- ***But,*** has engineered regular movement & activity out of our daily lives

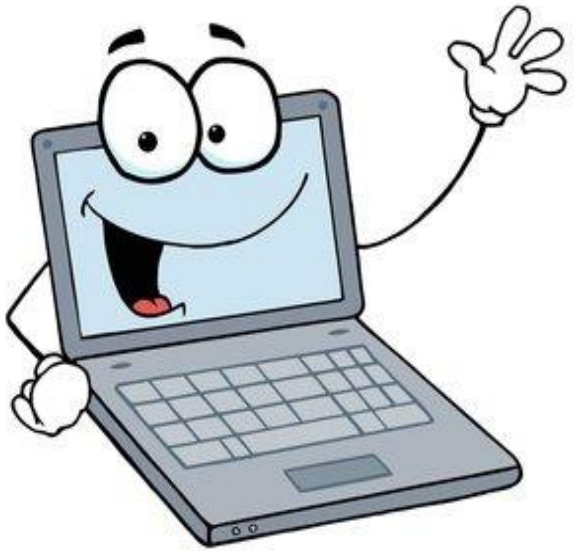
- How can we harness technology for ***"good"*** in PA area?

Technology as a ***Solution?***

It Offers:

- Real-time Information capture
- Delivery of personalized, contextually relevant messages & information
- Population Reach (& impact)



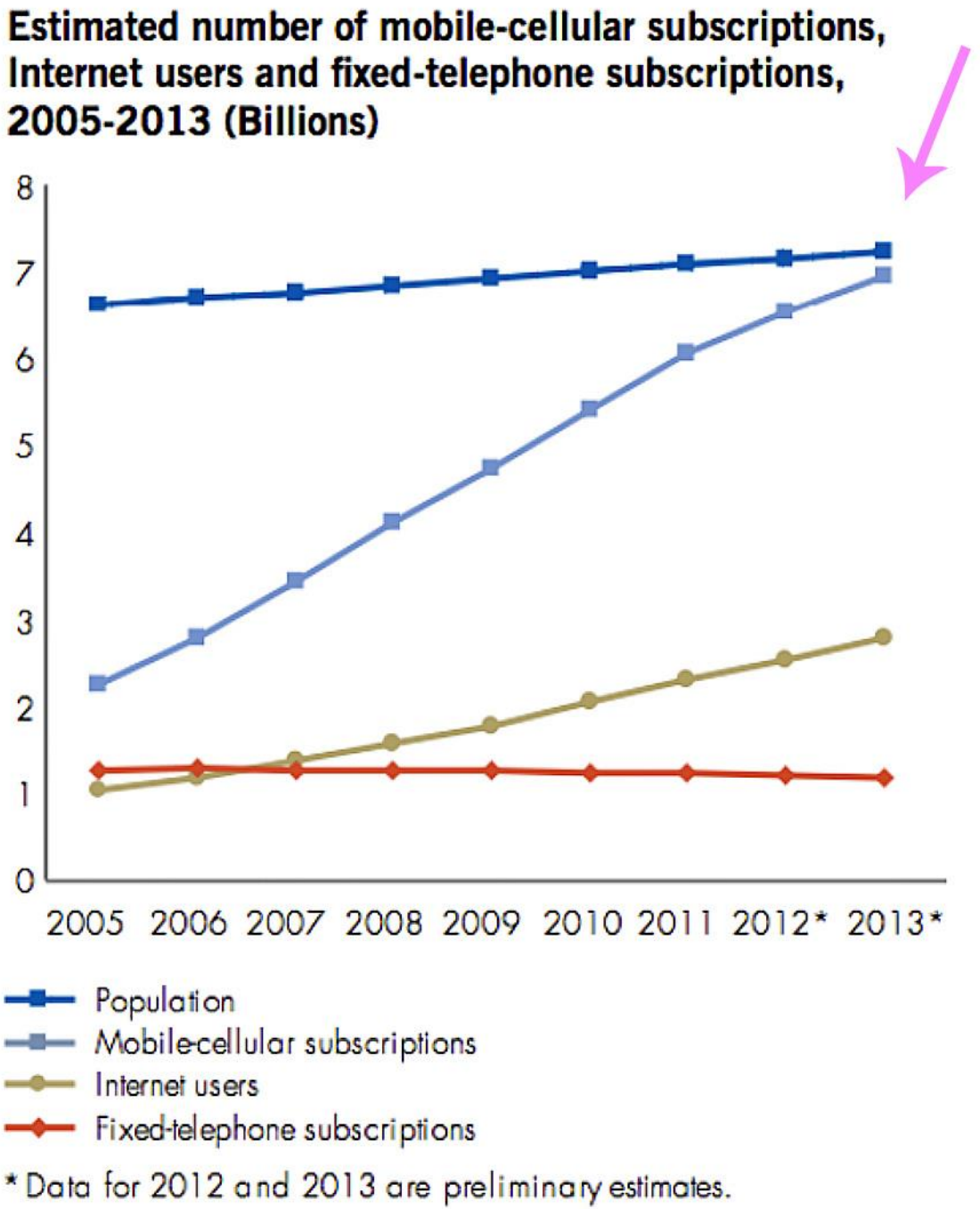


For example-

EXPLOSION of Cellphones around the world

- About as many mobile phone subscriptions as *people* in the world
- 91 countries have *more* cell phones than people (2011)
- mobile phone growth ***regardless of economic development***

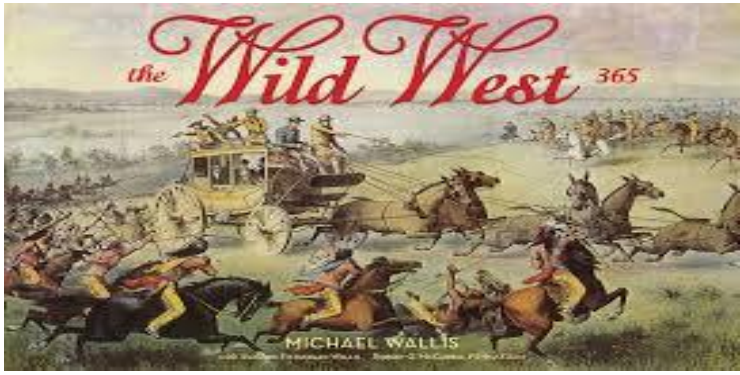
United Nations Millennium Develop. Goals Report, 2013



BUT . . .

- While IT potential is vast…

- ***"Wild West"***, little evaluation of efficacy



- Traditional Science too slow, **not agile enough** to capture current trends, innovations

What's Needed – one possibility

Community-Engaged 'Citizen Science'

that brings together:

Researchers

+

Organizations

+

Residents

to harness potential of IT/mobile devices to solve

'big hairy PA promotion challenge"

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Can Apply this approach to **different IT Domains,** including:

- **Me**

- **We**

"ME" domain

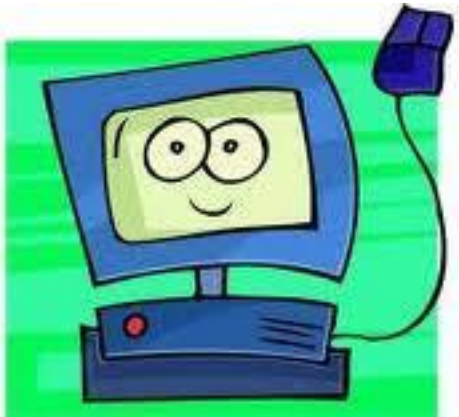
Quantified Self (mobile & wireless devices)

- Large # of "N-of-1 individual experiments" occurring across the population at large, involving . . .
- Personalized ***"just-in-time" sensing & data collection*** by a growing number of individuals
- 'Data hubs' in public & private sectors are emerging to ***combine & make sense*** of all these data
- Significant opportunities in PA & other arenas through partnering with industry

"ME" - continued

In addition to quantification & assessment,

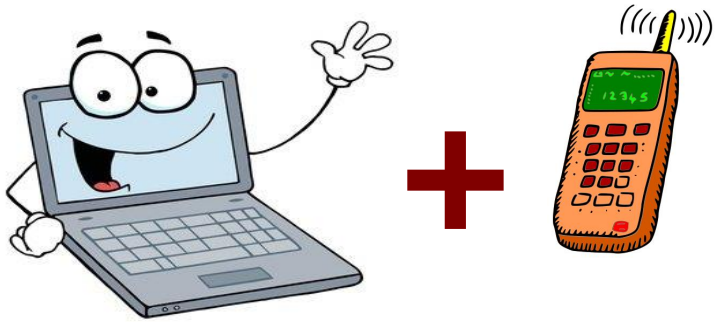
- **Personalized "IT Advisors" for *physical activity promotion* (intervention)**



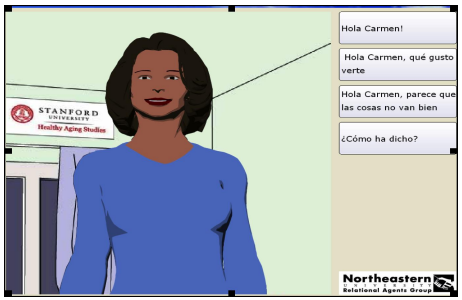
Individually-Adapted IT Interventions:

EXAMPLES

- ***Tele-health***



- ***'Virtual' Advisors***



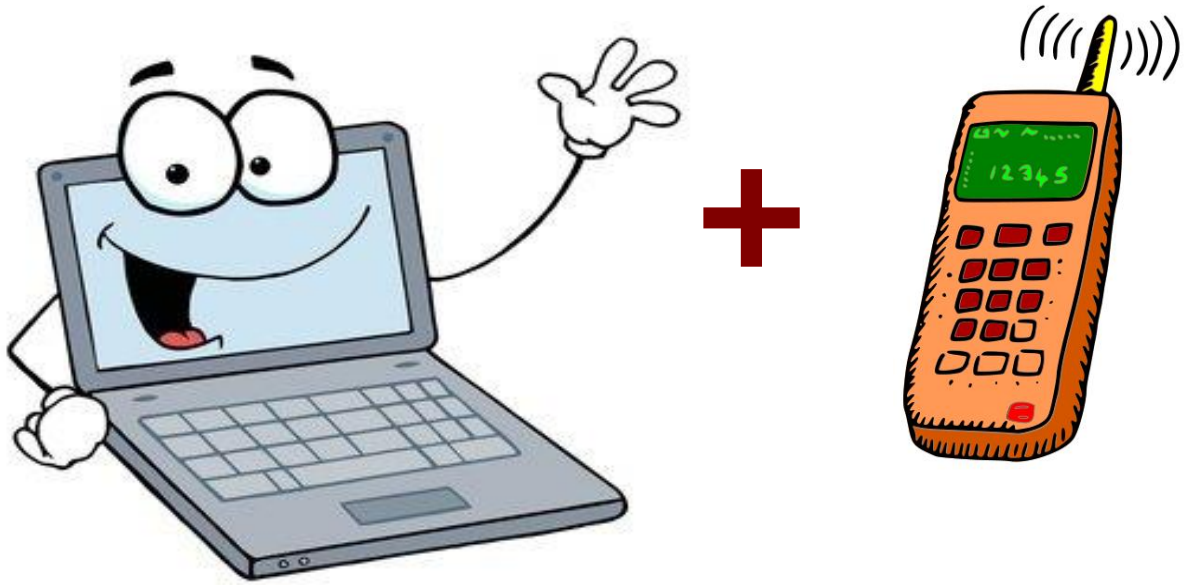
- ***Smartphone App platforms***

Fortunately, *Evidence-based* Behavioral Strategies that work ***across Communication Channels***

- Realistic outcome expectations
- Increased awareness (mindfulness)
- Exploring personal benefits & costs
- Personal goal-setting
- Self-monitoring
- Regular feedback
- Social support

Tele-Health by Computer

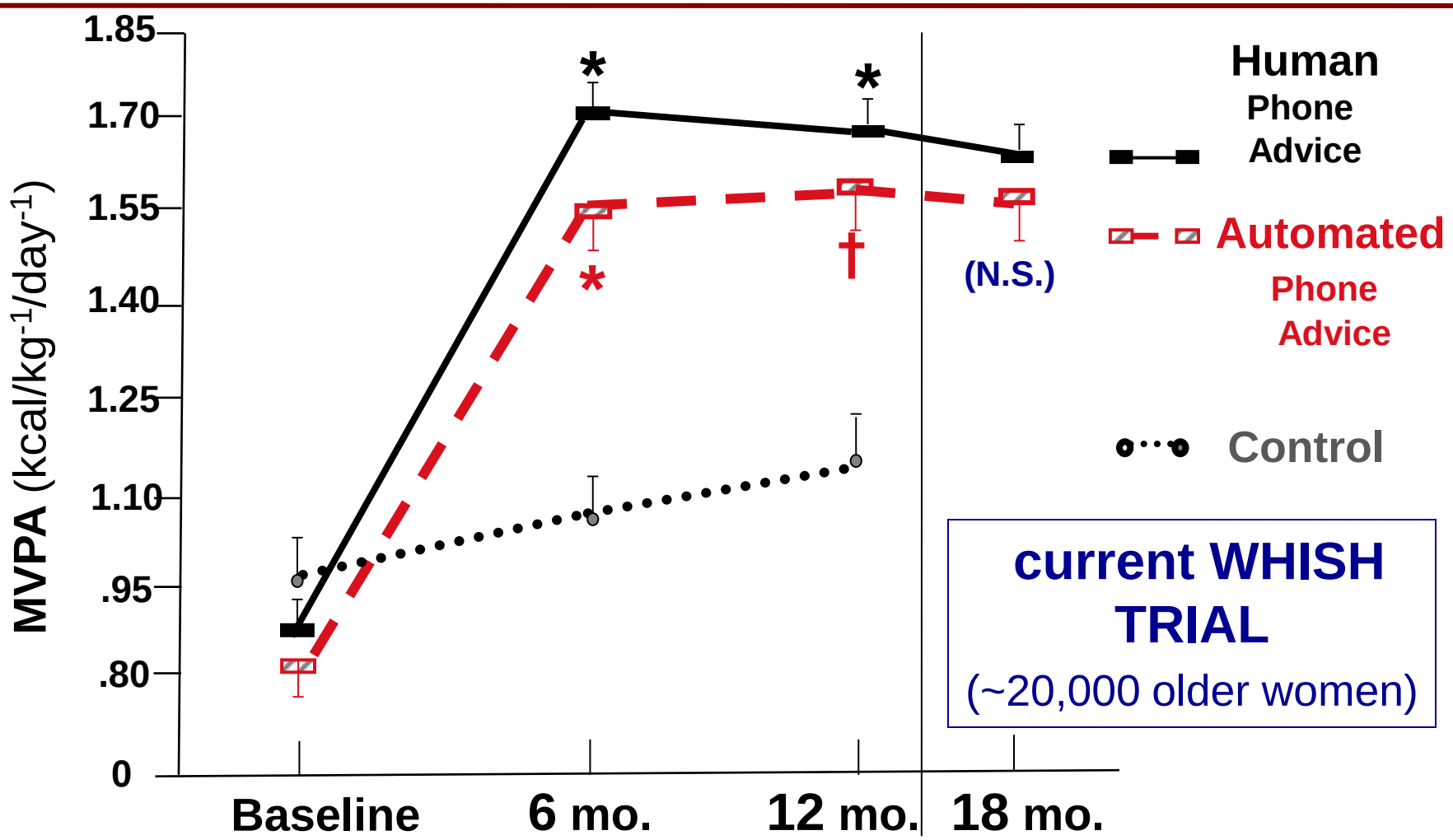
Can ***Automated systems*** replace Human instructors in promoting regular physical activity?



(think phone-based airline reservations “agent”)

(CHAT)

Estimated Energy Expenditure in MVPA (7-day PAR)

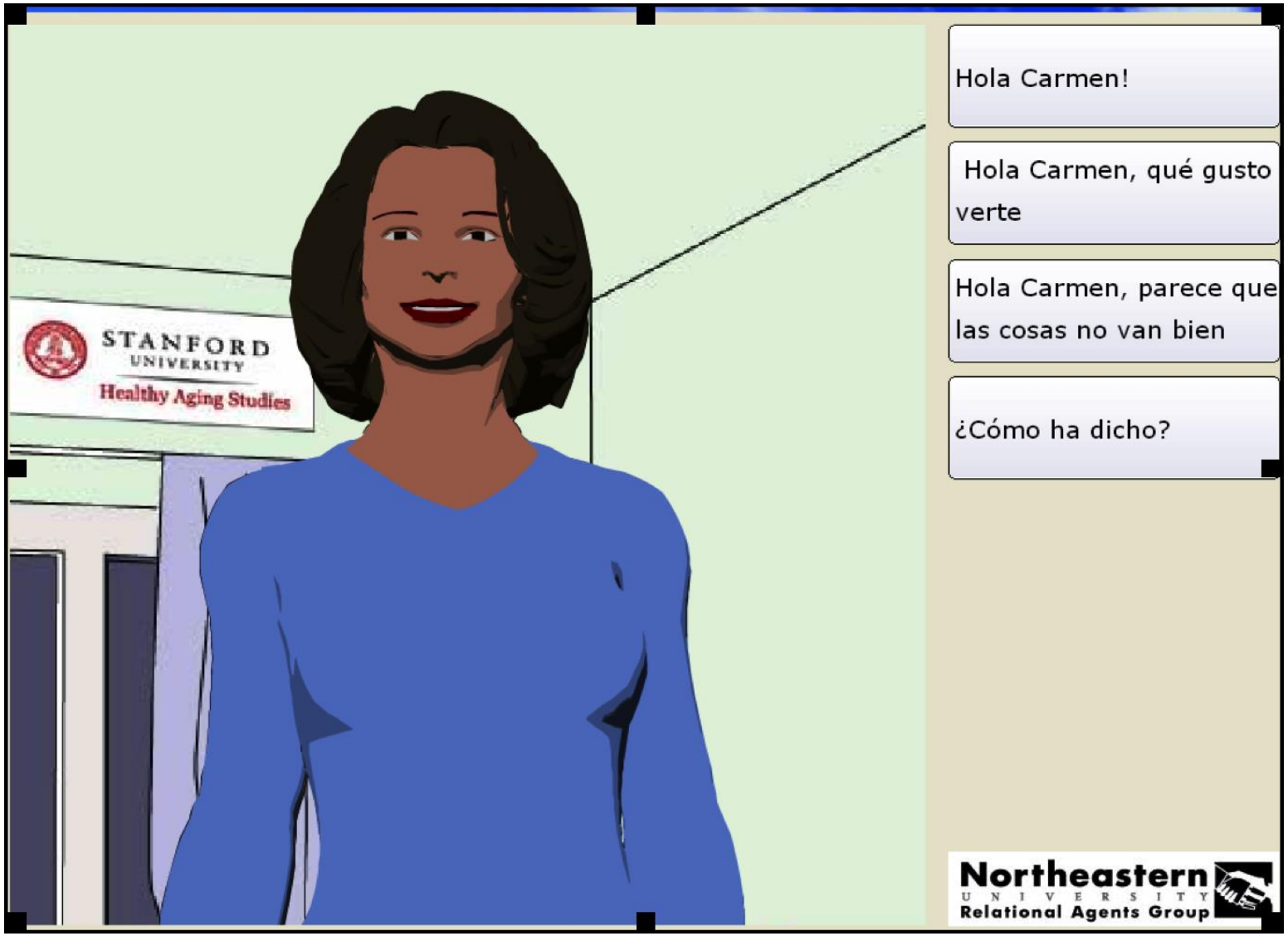


*Intervention > control, $p \leq .01$; †Intervention > control, $p = .05$

King AC et al., *Health Psychol, 2007;* 218 inactive adults 55 yrs+

Another side to Personalized Technology:
Preventing Widening of *Health Disparities Gap*
("digital divide")

- **Language issues**
- **Reading levels**
- **Computer access/skills/comfort levels**
- & **Health literacy**
- ***'Virtual Advisors'***
  – Provide *tailored interactions* via both simple **verbal & nonverbal communication**



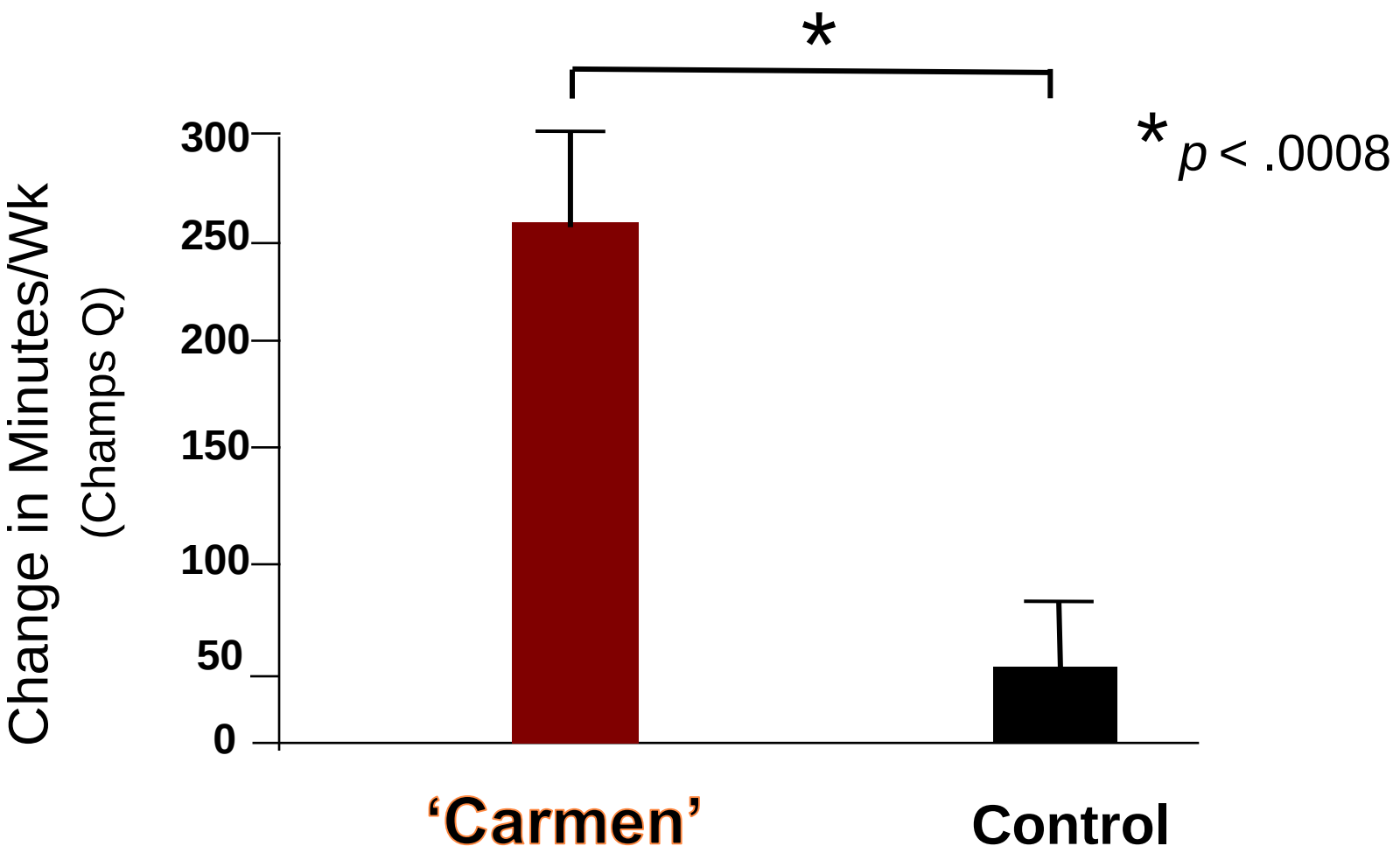
Carmen

(Culturally adapted, bi-lingual, touch-screen interface)


Participant
“talking”
with
Carmen

4-month Change in Minutes of Walking/Week

(N = 40; low-income Latino Older Adults with low computer literacy)



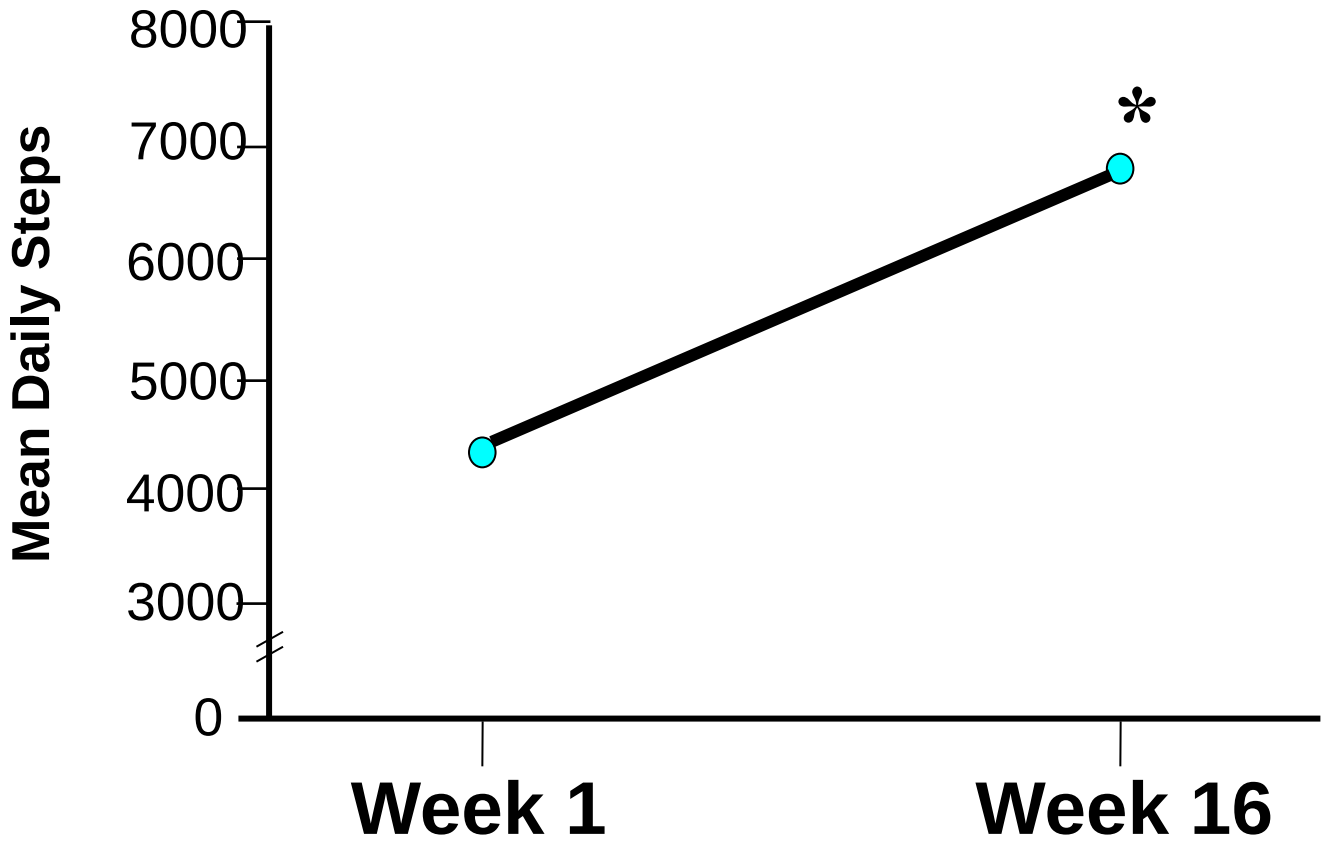
King, Bickmore et al., *J Health Communication,* 2013

COMPASS Study

4-month Change in Daily Steps

(Omron Pedometer)

Intervention Participants (n = 20)



* Slope analysis: $p = .002$, King et al., 2013

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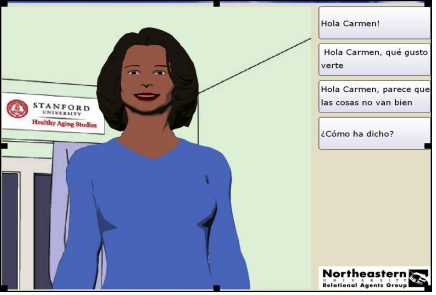


At 4-month Post-test, ***Intervention participants indicated that . . .***

- 'Carmen' *cared* about them (mean rating = 6.2 out of 7)
- *Felt close* to 'Carmen' (mean= 6 out of 7)
- *Trusted* 'Carmen' (mean= 6 out of 7)
- Were interested in *continuing to work with* 'Carmen'

(& did so **over next 5 months** after research ended)

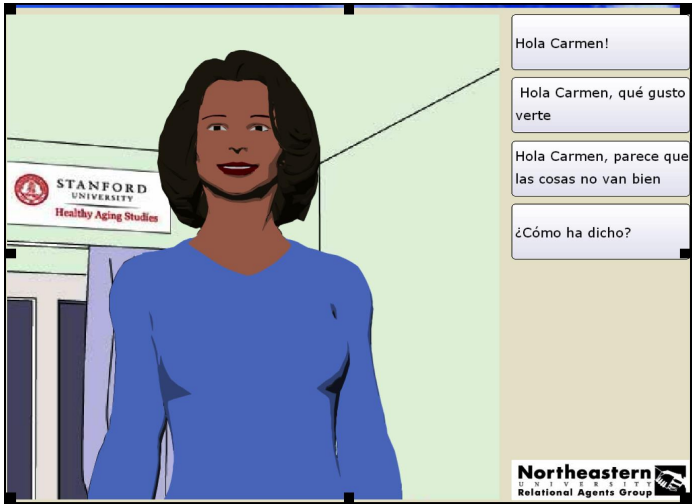
(from Working Alliance Inventory)

King, Bickmore et al., *J Health Communication,* 2013

Next Steps for Virtual Advisor

- Testing Carmen in more *community settings* to evaluate **longer-term effectiveness**, vs. humans, in inactive, Latino aging adults [NIH R01HL11644802]

- ***Examples of Other Potential Settings:***
  - Clinics; pharmacies
  - Libraries
  - Worksites
  - Recreational centers
  - Schools
  - Shopping Malls

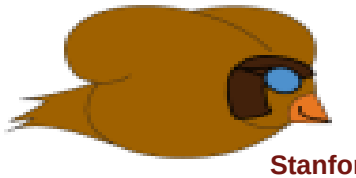


Smartphone applications –

Increasingly popular & ubiquitous channel

- Huge # that passively assess **PA** via built-in sensors (i.e., accelerometer, GPS) & may provide just-in-time feedback for behavior change

- But few employ other theoretically- or empirically-based strategies to systematically enhance motivation & behavior over time



King AC, Hekler EB, Grieco LA, et al. PloS One. 2013; 8, e62613

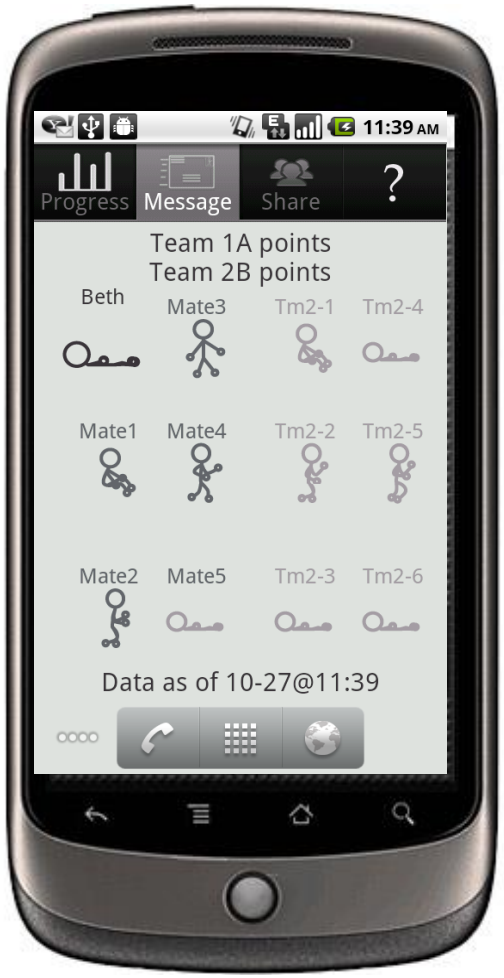
Smartphone Apps for *walking more & sitting less*

(using different motivational frames)

Analytic

Affect/Play

Social



King, Hekler, Grieco, Winter, Buman, et al., *PLoS ONE,* 2013

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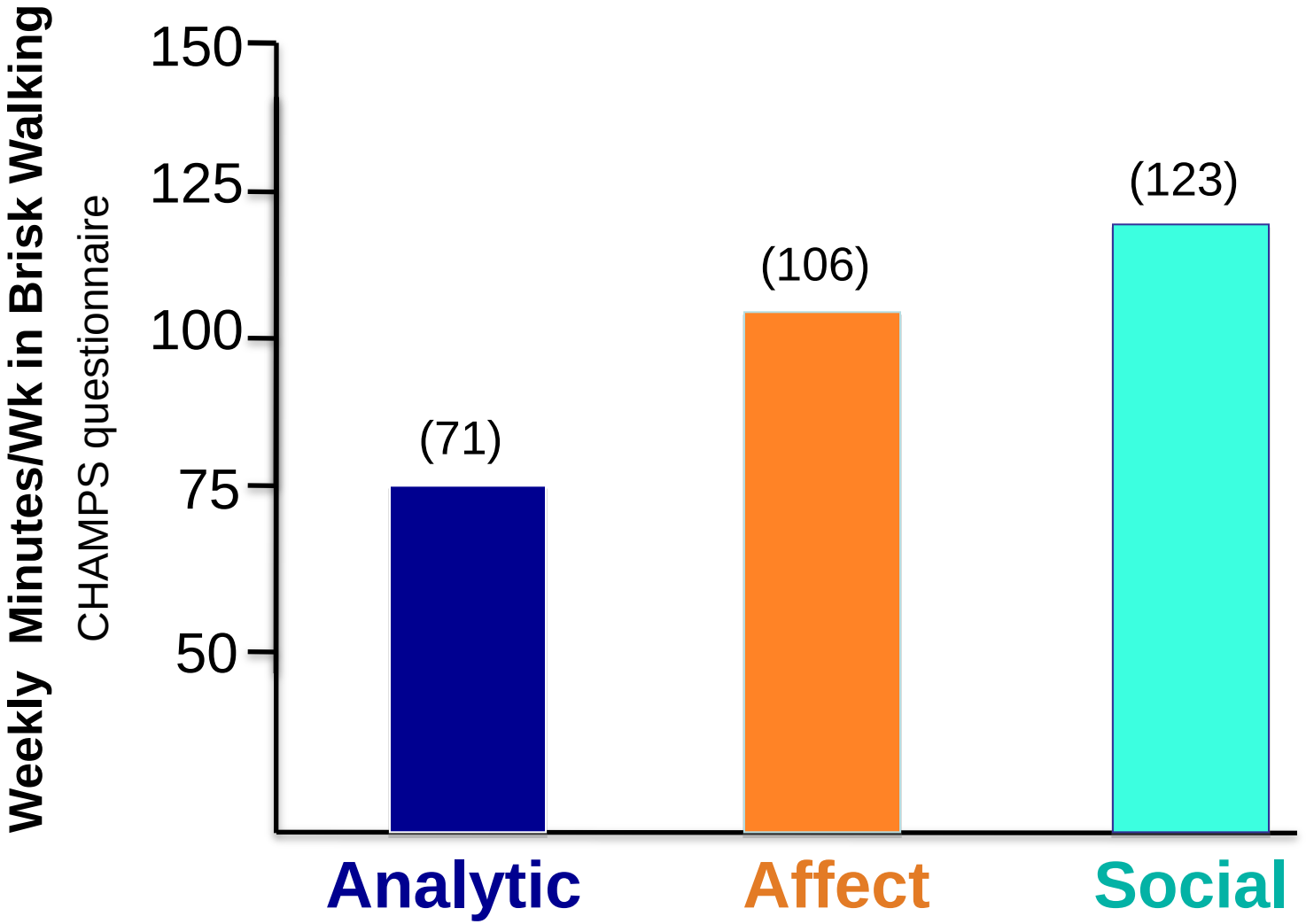
MILES study – ***Increase in Daily Walking* (2 months)**

(n = 68 adults ≥ 45 yrs, inactive, 1st contact with Smartphones)

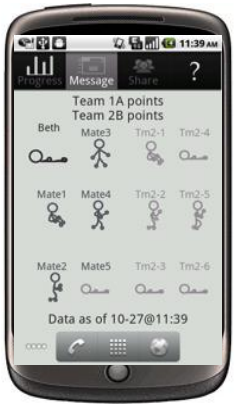


King, Hekler, Grieco, et al., *PLOS One,* 2013

When tested in an Experiment

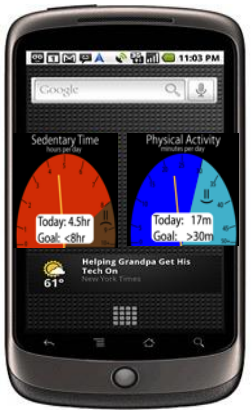
(2 months; with Calorific control app)

Using smartphone's built-in accelerometer:



- **MVPA: Social** app did best (p<.05)

  - Other 2 apps = More variability in R; ***(which app for whom?)***



- **Sedentary time: Analytic** app decreased **TV sitting time** relative to apps without explicit sedentary feedback

What does the Future hold?

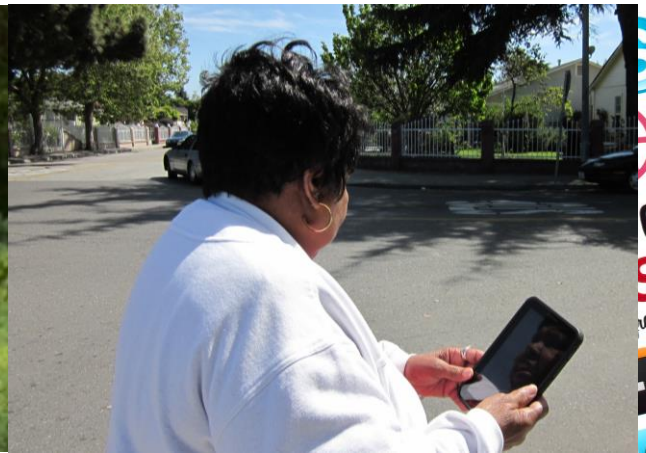
Technology that informs/motivates but *"gets out of the way"* of **Active Living**

Experiencing the World through a ***Screen***

Going up a level:

"WE" domain

- Empowering ***'Citizen scientists'*** to assess & *advocate* for healthier neighborhoods & communities
- ***Social environments*** & physical activity

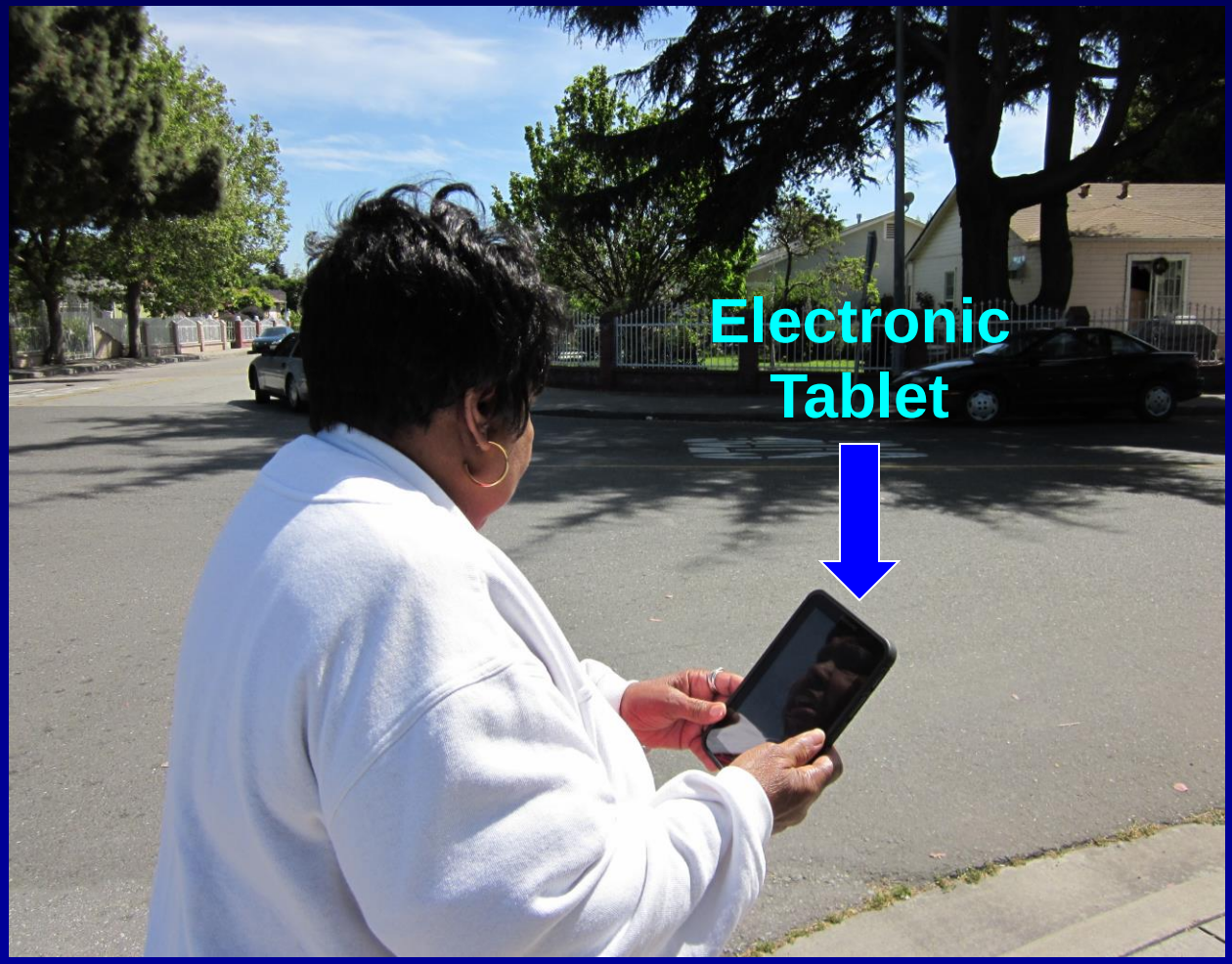


‘Citizen Science’ healthy neighborhood projects *aim to:*

- Use simple **technology** to help **Low-Income, underserved residents** identify ***Neighborhood features*** that:
  - Help or hinder ***Active Living*** & ***Healthy Eating***
- Residents **prioritize issues** (feasible, low-cost)
- learn how to **Build community partnerships**
- learn to **Advocate for change** with community decision-makers

Buman, Winter, et al., *Translational Behav Med,* 2012; *AJPM,* 2013

residents use ***Stanford Healthy Neighborhood Discovery Tool***



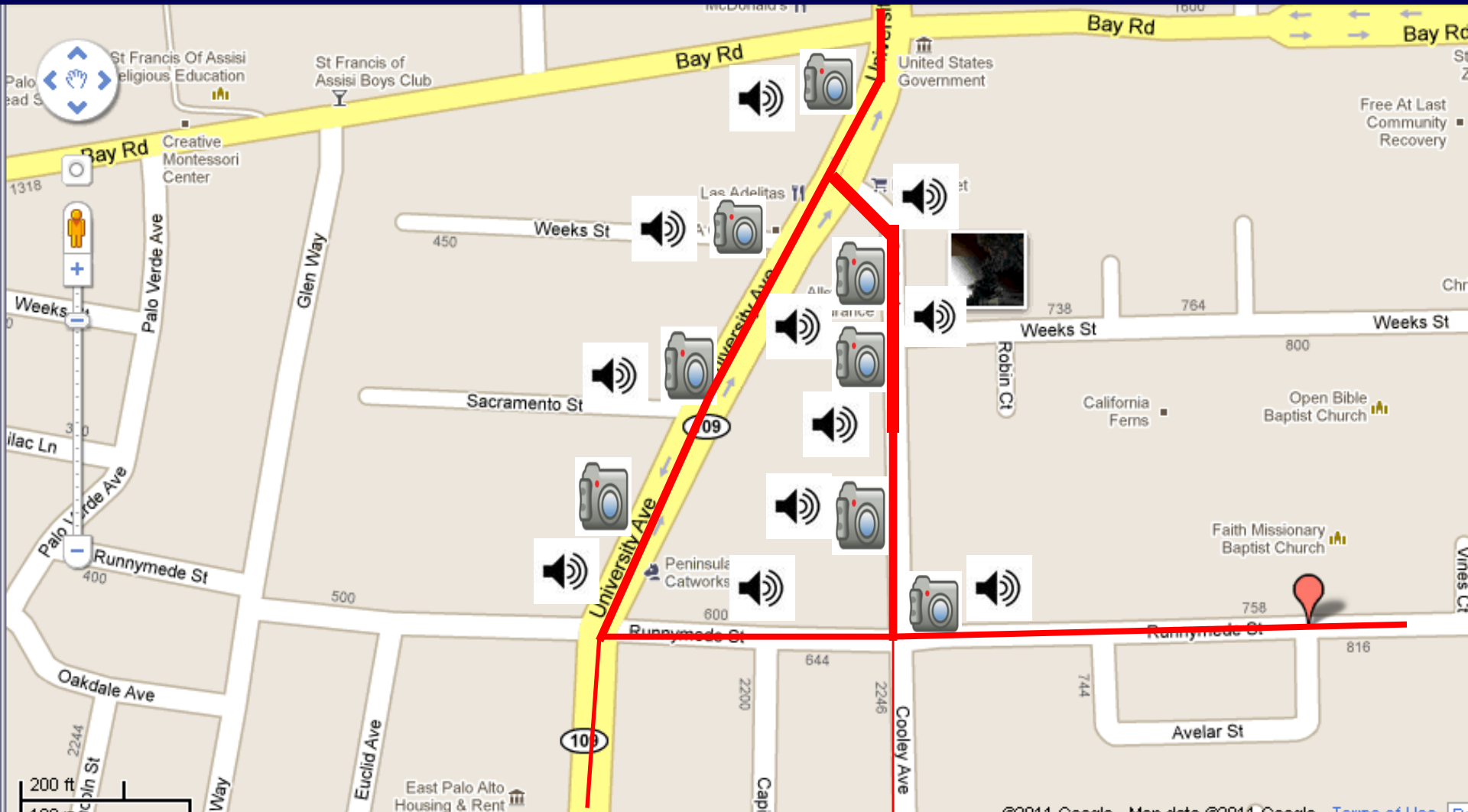
Captures Barriers to Walking/Food Access

(Tool collects neighborhood info via GPS Route tracking/ Geo-coded Photos & Audio narratives)

Goal: **Aggregated View for Policymakers**

(‘crowd-sourcing’ tool to empower residents)

Runnymeade Gardens Senior Housing, East Palo Alto



Examples of barriers in E. Palo Alto: lack of ***Safe Crossings & Paths to Public Transit***

(Residents have worked with city & other organizations)

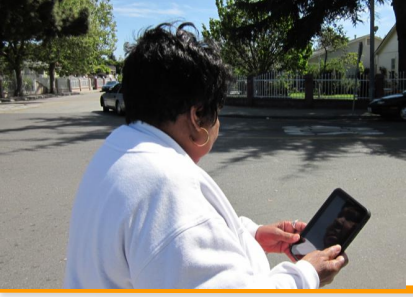
Traffic Calming

Improved Access to Public Transportation

NEAAT Successes in East Palo Alto, CA

- Older low-income Residents were able to use Discovery tool to **identify neighborhood barriers** to PA/food & **advocate for changes**
- In response, City planning committee & City Council allocated ~$400,000 for needed city-wide sidewalk repairs & improvements (e.g., shade trees) to facilitate walking

Winter S, et al. *Translat Behav Med,* 2014



Other *Successes,* *using the "Citizen Science" model* include:

- *N. San Mateo County, CA—* ***Increasing Food Access:*** 84% of low-income residents contacted local policy maker, or used a new community food service [Senior Advocacy Team formed]

- *N. Fair Oaks, CA—****Intergenerational Solutions:*** Latino teens & older adults have improved neighborhood for walking

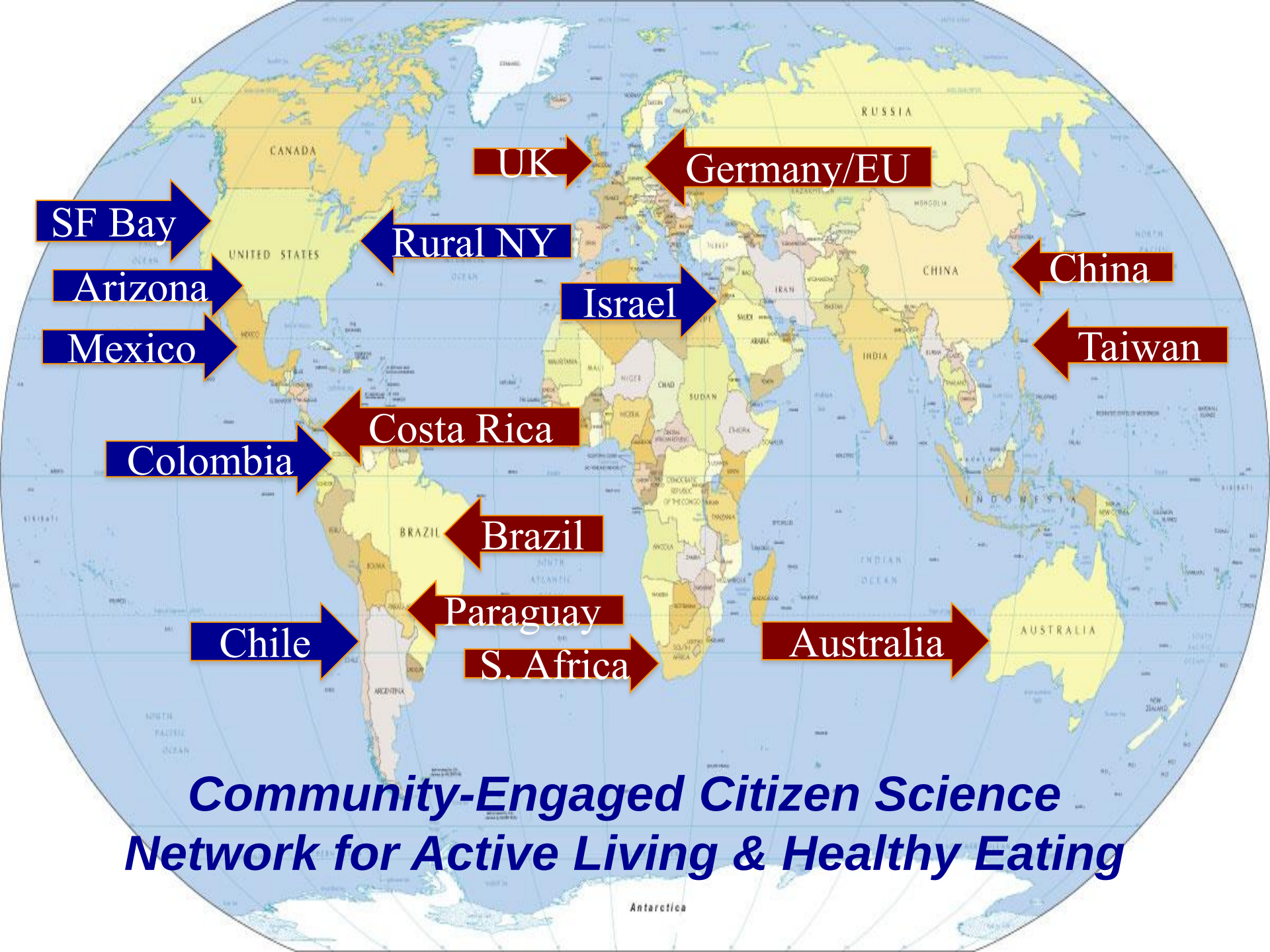
- *Cuernavaca, Mexico—****Improving Healthy Living:*** Citizen coalition to increase neigh. cohesion & safety

Citizen Science Activities - continued

- Israel—***Multi-cultural cooperation for active living:*** Israeli Arab & Jewish residents are generating collaborative solutions

- Bogotá, Colombia—*Evaluating* ***city-wide recreational offerings*** among diverse groups (including homeless)

- 4 Rural Counties in Upstate NY—*Catalyzing positive change in* ***rural food & activity environments***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Arizona
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China
Mexico
Taiwan
Costa Rica
Colombia
Brazil
Paraguay
Chile
S. Africa
Australia
Community-Engaged Citizen Science
Network for Active Living & Healthy Eating

Another side to social environments:

Harnessing **Social Networks** for *Change*

Through processes like ***Homophily -***

Perceived ***similarity*** between people promotes identification, social modeling

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Field is ripe for more research on

"spread of Physical Activity" via Social Networks

Hinyard L & Kreuter M, 2007, *Health Educ Behav;* Centola, Science, 2011

In Summary –

Some Thoughts about What we Can Do

- Harness power of ***Intersectoral*** & ***Intergenerational*** teams to "push the envelope" in PA field & learn IT language/'culture'/opportunities
- Look for opportunities to partner with ***private sector***, as well as *community organizations*
- Employ culturally informed technologies to extend program reach for *all* groups to address ***health disparities***

Some Thoughts about What we Can Do - *continued*

- **Different communication channels** may work best for *different population segments* ('whiches' conundrum)

- Consider ***'stealth'*** interventions that tap into non-health values & motives (e.g., 'exergames'/fun, social connections, family, environ. sustainability, well-being)

- Tackle issues of ***privacy,*** anonymity, informed consent

Some Thoughts about What we Can Do - continued

- Continue to proactively promote physical activity & dietary change as ***complementary & synergistic partners*** in population-wide behavioral health

- Tackle built environment challenges not only from top down (e.g., policies) but simultaneously from ***bottom up*** through ***citizen science engagement***

In Closing,

Through challenging ourselves to *expand beyond our usual 'comfort zones'* in **leveraging the potential of IT . . .**

Researchers

+

Organizations

+

Residents

We will be better able to meet the Challenge of not only anticipating the future, but Creating it

Thank you!

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