Using Ecological Momentary Assessment to Examine Whether Environmental Perceptions Mediate the Effects of Smart Growth Planning on Physical Activity and Obesity

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Smart Growth Planning Principles

1. A range of housing opportunities
2. Walkable neighborhoods
3. Community and stakeholder collaboration
4. Distinctive community with sense of place
5. Cost effective development decisions
6. Mixed land use
7. Preservation of open or green space
8. Variety of transportation choices
9. Development of existing communities
10. Compact building design (increased density)

Perceived Environmental Features and Physical Activity

- Vegetation/Greenness (Tilt et al., 2007; Sugiyama et al., 2008)
- Aesthetics (Inoue et al., 2011; Saelens et al., 2011)
- Safety (Zoellner et al., 2012; Tucker-Seeley et al., 2009)
- Garbage/Physical Disorder (Corseuil et al., 2011)
- Traffic Volume (Hoehner et al., 2005; McGinn et al 2007)

Uncertain Geographic Context Problem (UGCoP) (*Kwan, 2012*)

Lack of clarity about:

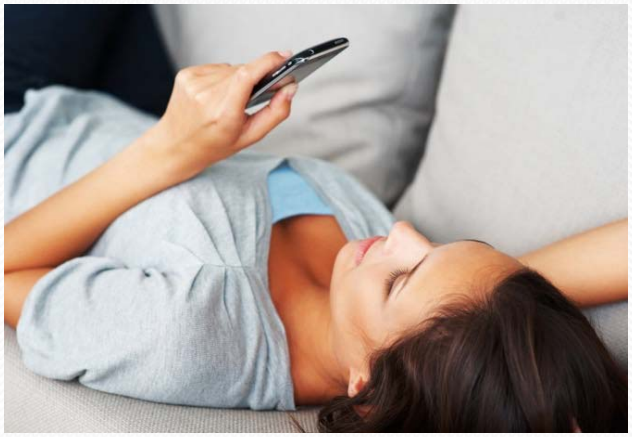
1. The specific context or setting that has a direct influence on health-related behaviors

2. The timing and duration of individuals' actual exposures to these contextual influences.

Ecological Momentary Assessment (EMA)

- **Ecological**
  - Real-world environments & experience
  - Provides ecological validity
- **Momentary**
  - Real-time assessment & focus
  - Avoids recall bias
- **Assessment**
  - Self-report
  - Repeated, intensive, longitudinal
  - Allows analysis of physiological/ psychological/behavioral processes over time

(Stone & Shiffman, 1994)



Study Objectives

Determine whether perceived safety, traffic, and aesthetics of settings, *where physically activity actually occurred*, mediate the effects of living in a smart growth community on:

- physical activity
- body mass index (BMI)
- waist circumference in adults

Project MOBILE

Measuring Our Behaviors in Living Environments

- Two-group quasi-experimental design ("natural experiment")
- Treatment: Adults (n = 60) who had recently moved to a smart growth community in Southern California

  Control: Demographically-matched adults (n = 60) living in nearby urban-sprawling comparison communities
- 2 waves of EMA separated by 6 months

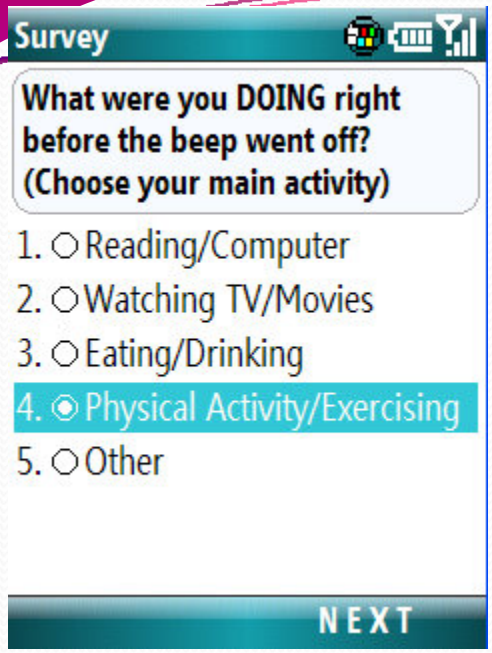
THE PRESERVE™
AT CHINO

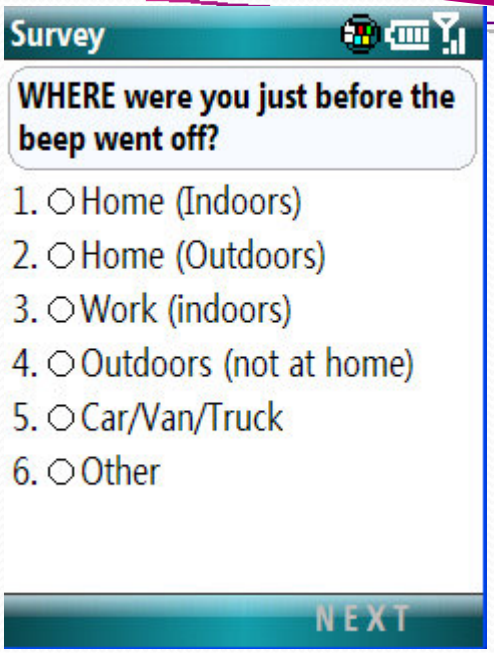
EMA Procedures

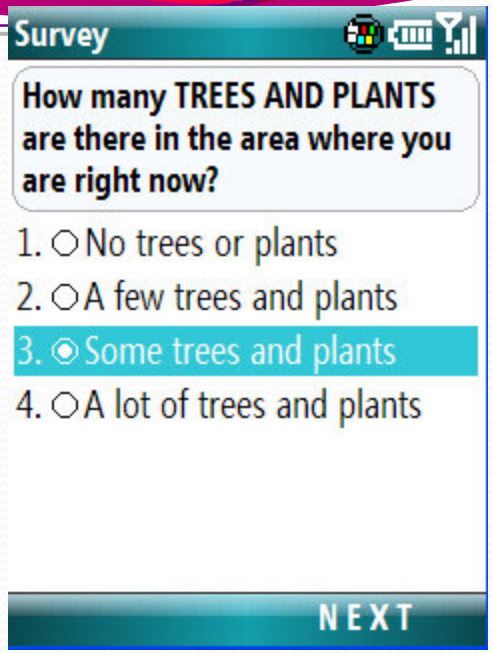
- Loaned mobile phone (HTC Shadow, T-Mobile)
- Monitoring occurred across 4 days (Sat.-Tues) for each wave
- Signal-interval contingent hybrid sampling

Ecological Momentary Assessment Prompting Schedule

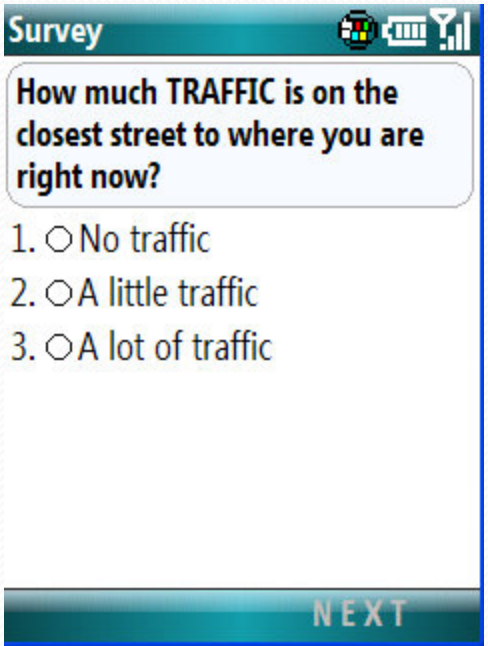
Day	6:30am	8am-10am	10am-12pm	12pm-2pm	2pm-4pm	4pm-6pm	6pm-8pm	8pm-10pm
Saturday	X	X	X	X	X	X	X	X
Sunday	X	X	X	X	X	X	X	X
Monday	X	X	X	X	X	X	X	X
Tuesday	X	X	X	X	X	X	X	X


Survey
What were you DOING right before the beep went off? (Choose your main activity)
1. ○ Reading/Computer
2. ○ Watching TV/Movies
3. ○ Eating/Drinking
4. ◉ Physical Activity/Exercising
5. ○ Other
NEXT


Survey
WHERE were you just before the beep went off?
1. ○ Home (Indoors)
2. ○ Home (Outdoors)
3. ○ Work (indoors)
4. ○ Outdoors (not at home)
5. ○ Car/Van/Truck
6. ○ Other
NEXT


Survey
How many TREES AND PLANTS are there in the area where you are right now?
1. ○ No trees or plants
2. ○ A few trees and plants
3. ◉ Some trees and plants
4. ○ A lot of trees and plants
NEXT


Survey
How SAFE do you feel where you are right now?
1. ○ Unsafe
2. ○ Somewhat unsafe
3. ◉ Somewhat safe
4. ○ Very safe
NEXT


Survey
How much TRAFFIC is on the closest street to where you are right now?
1. ○ No traffic
2. ○ A little traffic
3. ○ A lot of traffic
NEXT


Survey
How much LITTER OR GARBAGE is on the ground where you are right now?
1. ○ No litter
2. ◉ A little litter
3. ○ Some litter
4. ○ A lot of litter
NEXT

Physical Activity and Obesity Outcomes

- Actigraph GT2M (30-sec. epoch)- Daily moderate-to-vigorous physical activity (MVPA) (>2200 ct/min)

- Height, weight, waist circumference- Measured by research staff (BMI calculated)

Data Analyses

- Only included data when physical activity was reported in outdoor contexts (away from home).
- Data from the two waves were combined for the analyses.
- Person-level average scores for perceived safety, traffic, greenness/vegetation, shade, and litter were calculated.
- Direct and indirect effects tested using linear regressions and bootstrapping in the SOBEL macro for SPSS.

Descriptive Statistics

- Ninety-two out of 117 adults (79%) had at least one report of outdoor physical activity.
- Of these adults, 65 had EMA data on perceptions of these outdoor settings (perceptions assessed in a random 60% of EMA surveys).
- Between 3-42% of an individual's total physical activity was performed in outdoor settings.
- The percentage of physical activity performed outdoors was unrelated to age, sex, ethnicity, or income, MVPA, BMI, and waist circumference.

Demographics

	Smart Growth	Control
N	34	31
Age	M = 41.6 years (SD = 10.4)	M = 38.2 years (SD = 6.2)
Sex	62% Female	74% Female
Ethnicity	29% Hispanic	39% Hispanic
Annual Household Income	14% < $45,000 24% ≥ $100,000	13% < $45,000 30% ≥ $100,000
Weight Status	63% Overweight/ Obese	60% Overweight/ Obese

Differences Between Smart Growth (vs. Control) in Perceptions of Physical Activity Settings

	Smart Growth vs. Control	
	β	p
Safety	**.35***	**.01**
Traffic	**-.26^**	**.07**
Greenness	.36	.72
Shade	-.10	.49
Litter	-.11	.44

Note: All models adjust for age and sex.
Smart growth =1 and Control = 0.

Intercorrelations Among Perceptions of Physical Activity Settings and Outcomes

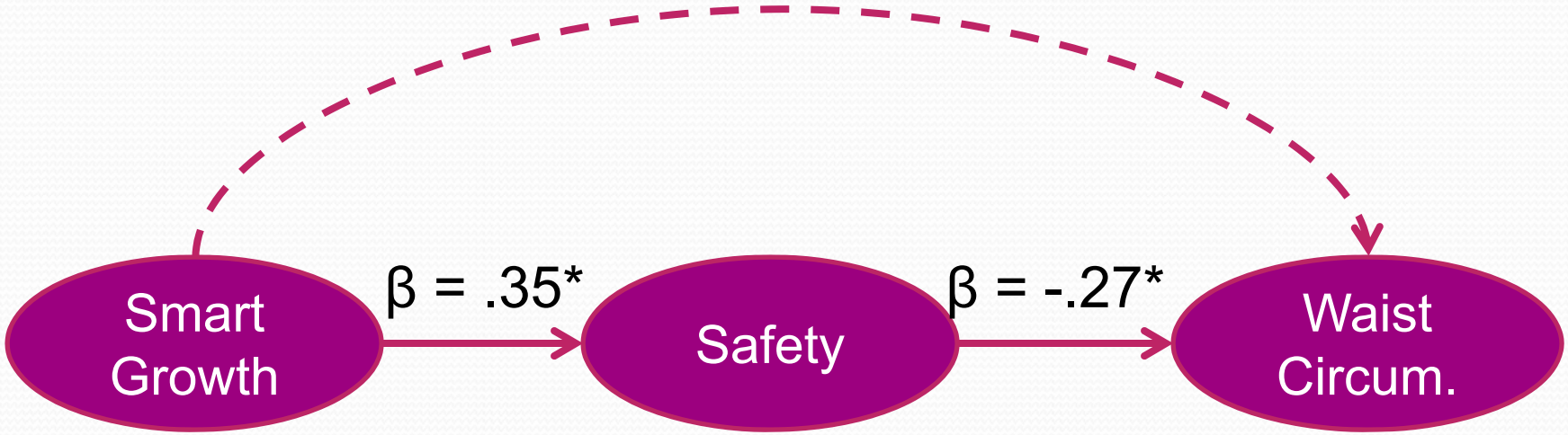
	MVPA	BMI	Waist
	β (p)	β (p)	β (p)
Safety	**.26^ (.05)**	**-.25^ (.06)**	**-.27* (.04)[a]**
Traffic	-.08 (.55)	.19 (.17)	.70 (.49)
Greenness	.17 (.21)	**-.25^ (.07)**	-.15 (.29)
Shade	**.25^ (.05)**	-.09 (.52)	-.11 (.41)
Litter	-.13 (.32)	.16 (.23)	.06 (.66)

Note: All models adjust for age and sex.

[a]Remains significant after adjusting for ethnicity and income.

Indirect Effect of Living in a Smart Growth Community on Waist Circumference

Indirect effect estimate = -3.39, 95% CI = -6.89 to -0.48



Limitations

- Perceptions not assessed during every physical activity episode
- Missing data (20% unanswered)
- Short monitoring period (8 days)
- 1-item measures
- Statistical power

Conclusions

- Greater perceived safety of physical activity settings may partially account for lower waist circumference among smart growth residents.

- Regardless of community residency, greater perceived greenness and shade were beneficial to physical activity and BMI.

- These settings may offer conditions that promote more sustained, intense and/or frequent activity and lower obesity risk.

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