

The Impact of Activities while Traveling on the Subjective Valuation of Travel Time

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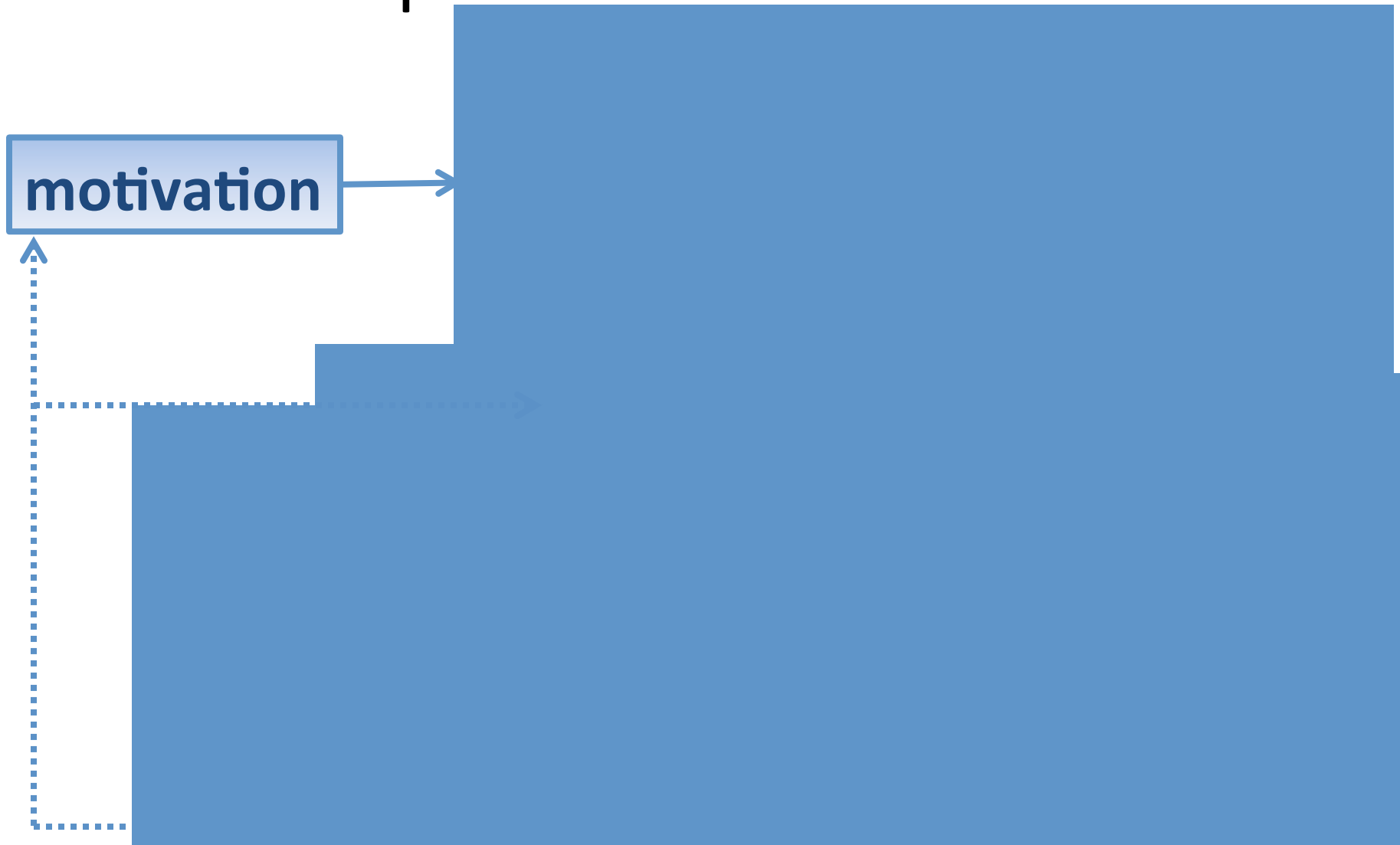
***Georgia Institute of Technology (USA)**

****Politecnico di Torino (Italy)**

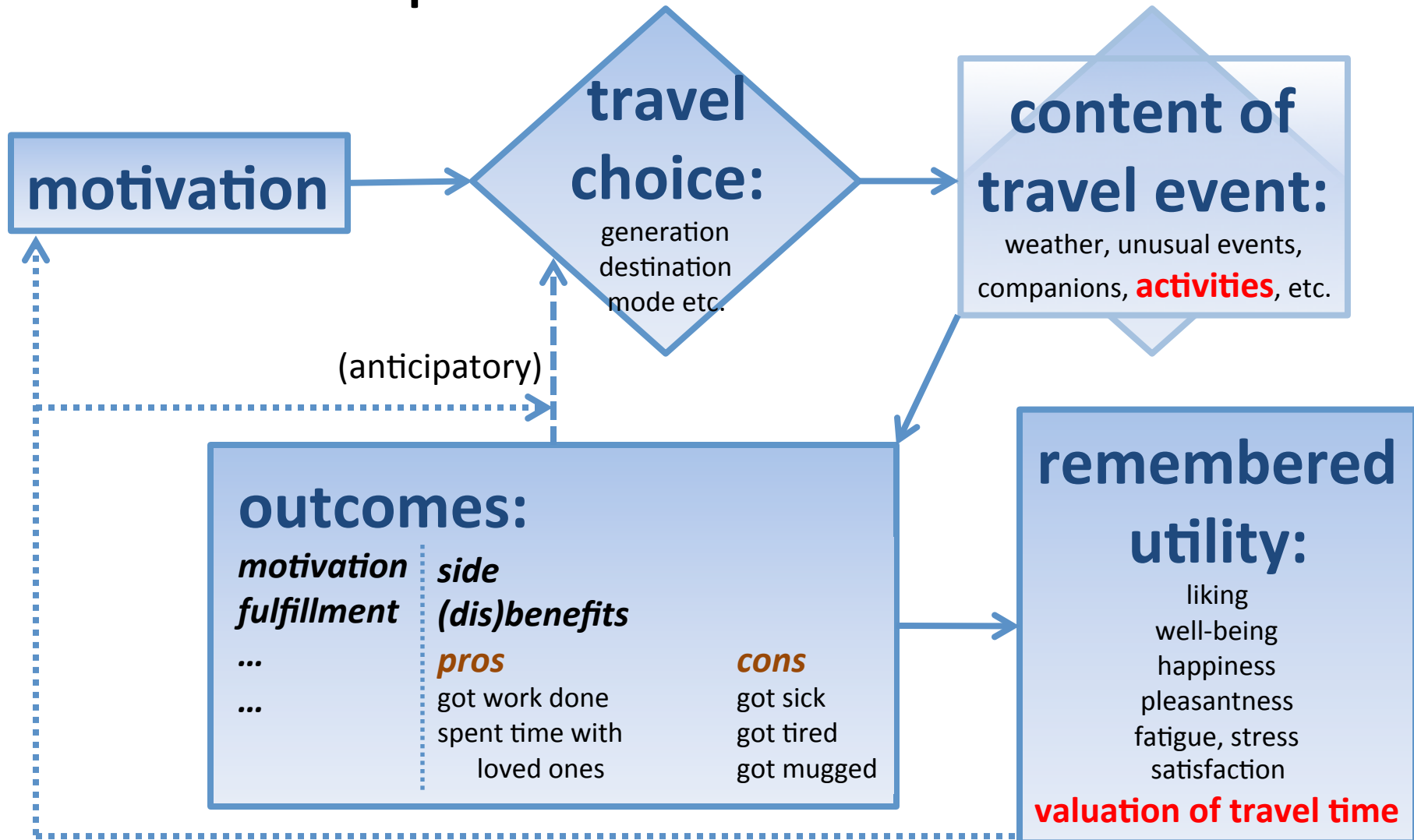
Northwestern University Transportation Center

Evanston, IL, April 23, 2015

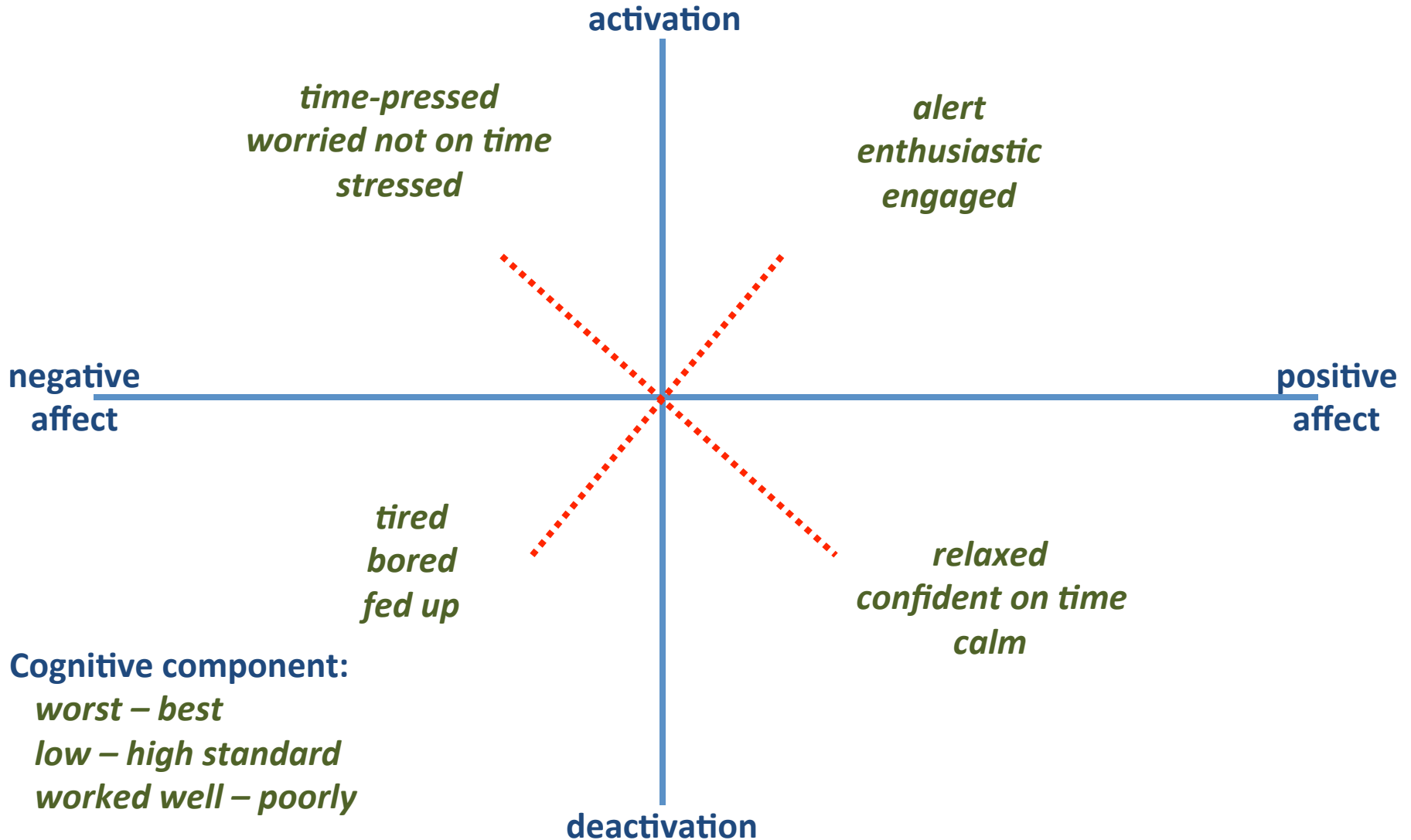
Personal travel decision inputs and outcomes



Personal travel decision inputs and outcomes



Satisfaction with Travel Scale



Sources of travel utility

Source→	1. Reaching desired destination	2. Activities conducted while traveling	3. Travel itself
↓ Nature			
Motivation			
Side (dis) benefit			



**THINK
OF IT AS A
CHAT ROOM**

Family life is busy, and time with your kids is never enough. Car time can be a great chance to chat, heart to heart, about some of the things your children face. Like pressure to try cigarettes.

Talking it through often can help kids resist the pressure they face. Grab the moment while you can. They'll be out on their own all too soon.

**TALK TO YOUR KIDS ABOUT
NOT SMOKING. THEY'LL LISTEN.**

Youth Smoking Prevention Philip Morris USA

Cancer, Heart Disease, And Emphysema.

Family life is busy, and time with your kids is never enough.
Car time can be a great chance to chat, heart to heart...



Sources of travel utility

Source→	1. Reaching desired destination	2. Activities conducted while traveling	3. Travel itself
↓ Nature			
Motivation	<i>common: "derived demand"</i>	<i>unusual but happens:</i> <ul style="list-style-type: none"> ▪ ride around Beltway to listen to new CD ▪ fly bus. class purely for business devel'mt opportunities ▪ shopping flights; gambling cruises ▪ opportunity to talk with significant other or children 	
Side (dis) benefit	<i>unusual but happens:</i> <ul style="list-style-type: none"> ▪ walk for exercise/ social; stop for ice cream ▪ joyride & see interesting place to stop 		

Sources of travel utility

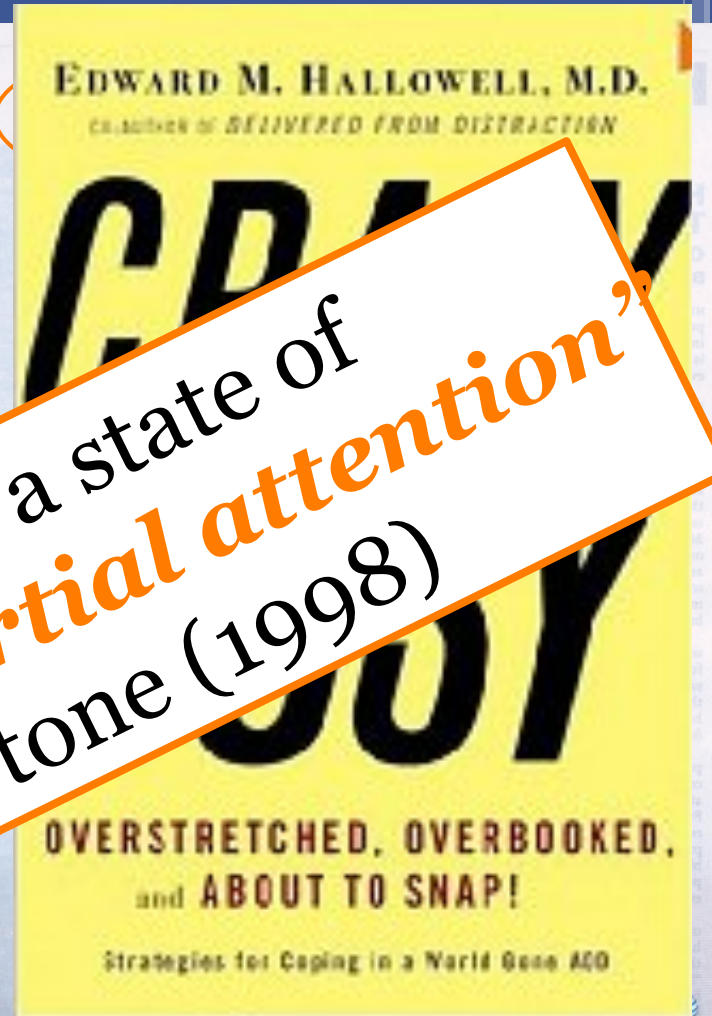
Source→ ↓ Nature	1. Reaching desired destination	2. Activities conducted while traveling	3. Travel itself
Motivation	<i>common: "derived demand"</i>	<i>unusual but happens:</i> <ul style="list-style-type: none"> ride around Beltway to listen to new CD fly bus. class purely for business devel'mt opportunities shopping flights; gambling cruises opportunity to talk with significant other or children 	<ul style="list-style-type: none"> curiosity adventure-seeking variety-seeking independence control conquest status therapy (mental/physical) buffer escape exposure to environment scenery, other amenities synergy physical exercise "need for speed"
Side (dis) benefit	<i>unusual but happens:</i> <ul style="list-style-type: none"> walk for exercise/social; stop for ice cream joyride & see interesting place to stop 	<i>common: a key interest of the present study</i>	<ul style="list-style-type: none"> ❖ outcomes of (un)pleasant "random" events while traveling ❖ inherent properties of modes/routes etc. (comfort, safety, ...)

Study motivation

- Multitasking:
 - Hallmark of modern life
 - Mixed blessing
- Travel:



We are all in a state of **continuous partial attention**
— Linda Stone (1998)



AT&T
The nation's largest 4G network.

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Among wireless networks in the 48 contiguous states and Hawaii. Talk and surf requires mobile broadband, not available in all areas. 4G speeds not available everywhere. ©2013 AT&T Intellectual Property. All rights reserved. Apple, the Apple logo, and iPhone are trademarks of Apple Inc., registered in the U.S. and other countries.

With respect to travel multitasking...

- We're not *just* interested in safety (distracted driving)





Innovation
that excites

WHAT IF YOUR BEAUTY SECRET WAS
SITTING IN TRAFFIC?
VITAMIN-C AIR CONDITIONER



Rather (in addition), we're interested in questions such as...

- Why do people (travel) multitask?
 - Decrease the burden of disliked travel/activity
 - Increase the pleasure of liked travel/activity
 - Increase productivity
 - Decrease time pressure
 - Decrease (or increase) stress
 - Reinforce self-identity
 - For its own sake
- ... and how do those diverse benefits interact with choices of activity, mode, etc.?

How does multitasking affect travel (and location) behavior?

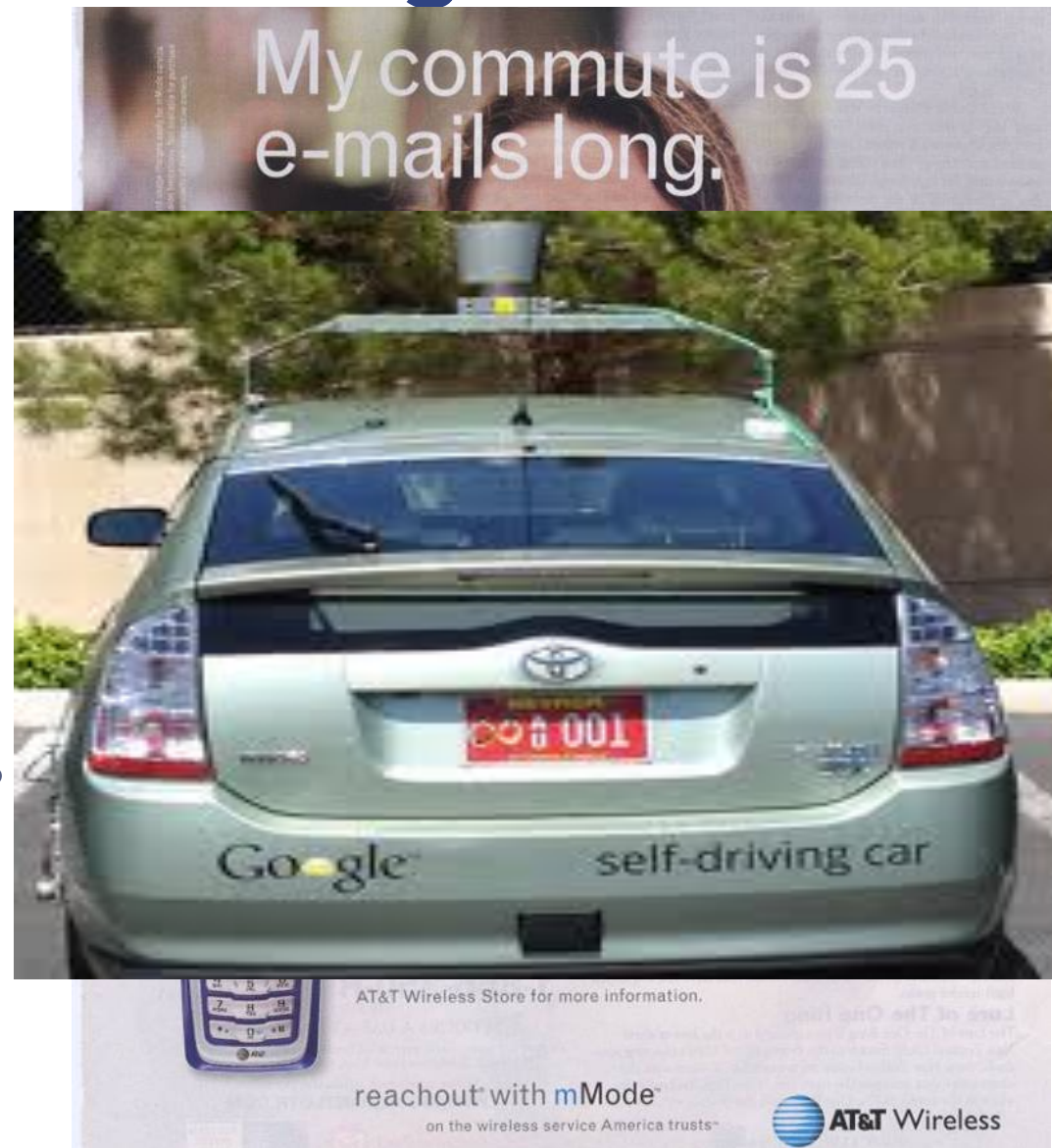
- The desire to minimize travel time is a bedrock presumption underlying most transportation planning, policies, and models
 - We assume people trade off time and money, and are willing to pay to reduce their travel time
 - Monetization of travel time savings is *by far* the largest component of “benefit” in standard cost-benefit analyses of proposed improvements
- But what if travel multitasking alters those calculations?

Does travel multitasking ...

- ... make people less inclined to reduce their commuting distance?
 - May be bad for sustainability – contribute to sprawl, resource consumption
 - May improve quality of life – increase job, housing choices

Does travel multitasking ...

- ... make people less inclined to reduce their commuting distance?
 - ... offer a competitive advantage to transit?
 - Some may prefer a longer transit commute to a shorter driving one, if they can use the time productively
- at least for now??

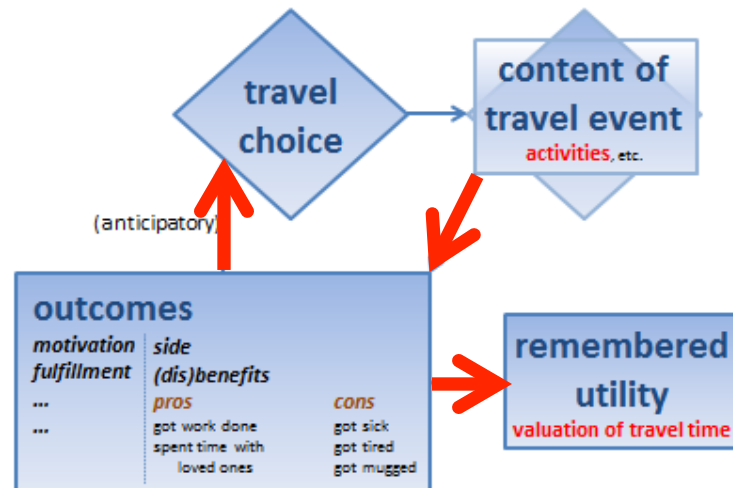


Does travel multitasking ...

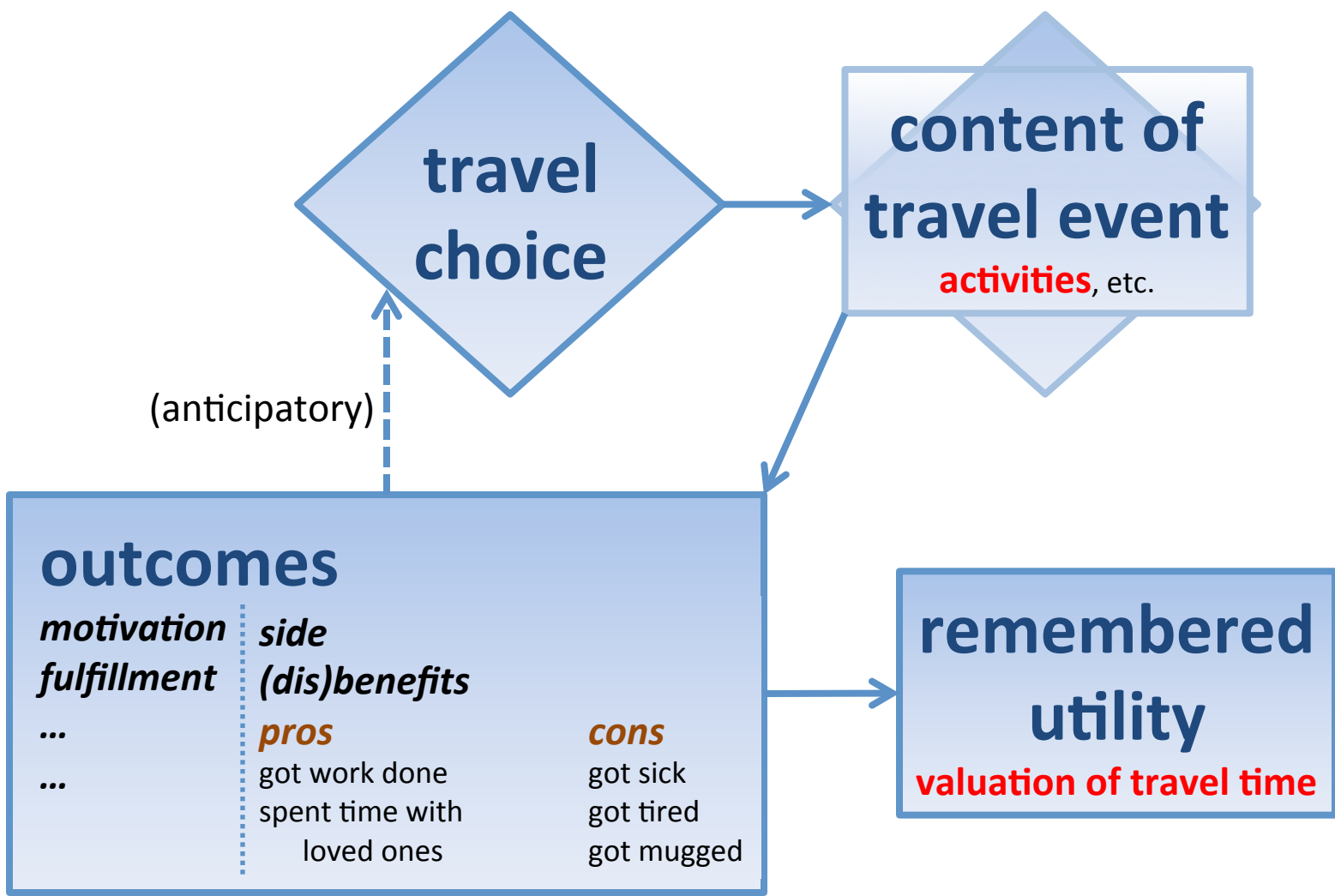
- ... make people less inclined to reduce their commuting distance?
 - May be bad for sustainability – contribute to sprawl, resource consumption
 - May improve quality of life – increase job, housing choices
- ... offer a competitive advantage to transit?
 - Some may prefer a longer transit commute to a shorter driving one, if they can use the time productively
- ... reduce the inclination to pay for travel time savings?
 - Could wreak havoc with conventional cost-benefit analyses

Currently active analyses

- How the *anticipated* (dis)benefits of travel-based MTing influence travel choices (*companion study of mode choice*)



- How *actual* travel-based MTing behavior influences the “remembered utility” (subjective valuation) of travel (*this study*)



Questions addressed by the present study

- Do multitasking propensities and activities conducted while traveling have an impact on the *perceived usefulness of time* spent traveling?
- How do these influences differ by travel mode?
 - We distinguish between *passive*-* and *active-attention*** modes

* *transit, commuter rail (train), ridesharing*

** *driving, biking and walking*

Empirical context

- Designed (lengthy!) survey
- Administered to Northern California commuters in fall/winter 2011-2012
- Multiple sampling strategies used

Data collection

Mode-specific:

- * SacRT
- * Capital Corridor (Amtrak)
- * BART
- * Yolobus
- * UCD & Bay Area carpoolers

Organization-specific:

- * Google
- * Commuter Club
- * UC Davis staff, students



Email blast:

- * Infogroup

Mail blast:

- * Random addresses along the Amtrak corridor

Online panel:

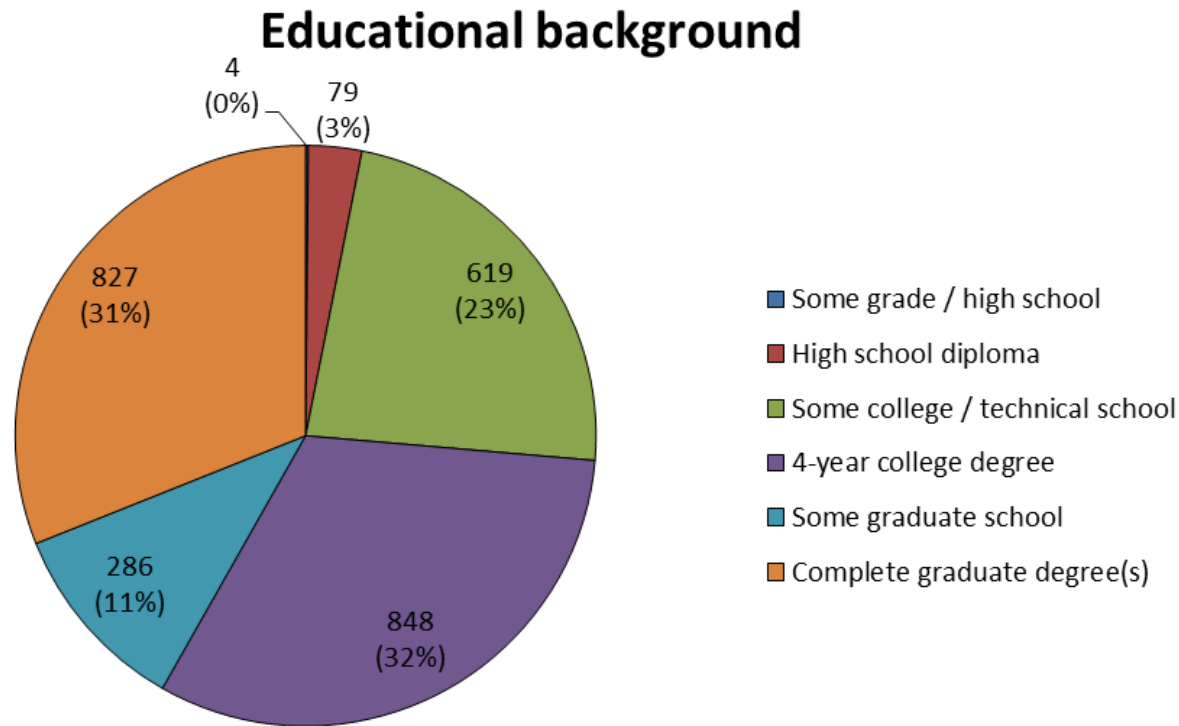
- * Survey Analytics

3 weeks of paper survey distribution (~3,000)

+ 3 months of online surveys (~30 varieties)

+ 6 months of data entry, filtering and conditioning

Sample description (N=2644)



Highly educated

High income

Female = 60%

Average age = 45

Deliberately

- oversampled bicyclists and transit / commuter rail passengers
- undersampled drivers

Survey contents

- A. Attitudes and personality
- B. Multitasking attitudes
- C. Time use expectations and preferences
- D. Attitudes toward waiting
- E. Perceptions of four commute modes
- F. A recent commute trip (primary commute mode, and activities conducted during the commute)

F5: In terms of its *value to you*, how would you rate the time you spent on this recent commute?

time
mostly wasted time 🍏 🍏 🍏 🍏 🍏 mostly useful

- G. “Internet Access On-the-Go”
- H. Daily commute
- I. Sociodemographic traits

→ more than 800 original variables

Multitasking-related explanatory variables

- General propensity (Part B)
- Engagement in various activities for *work* or *leisure/personal* purposes on the commute (Part F)

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Exit Survey 2

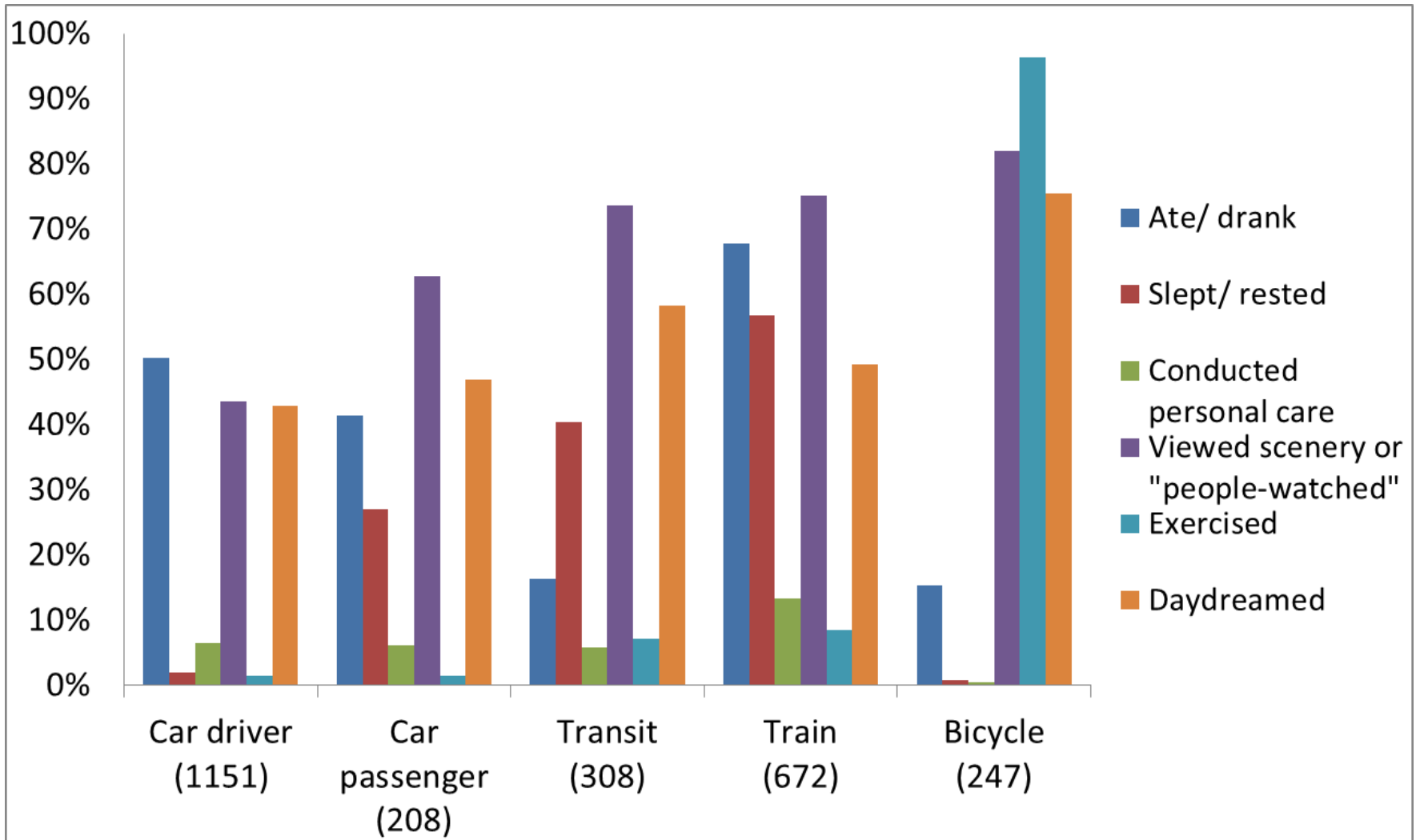
For each of the activities listed below, did you conduct this activity for **WORK** purposes on your most recent commute, *in either direction*?

	Yes	No
Listened to music or audio	<input type="radio"/>	<input type="radio"/>
Watched a movie / TV show / video	<input type="radio"/>	<input type="radio"/>
Spoke with other passengers whom I knew	<input type="radio"/>	<input type="radio"/>
Spoke with other passengers whom I didn't know	<input type="radio"/>	<input type="radio"/>
Used the internet	<input type="radio"/>	<input type="radio"/>
Talked on the phone	<input type="radio"/>	<input type="radio"/>
Used a smartphone	<input type="radio"/>	<input type="radio"/>
Composed and/or sent a text / SMS / e-mail message	<input type="radio"/>	<input type="radio"/>
Used a laptop, netbook, or tablet computer	<input type="radio"/>	<input type="radio"/>
Navigated trip (used paper map to find route)	<input type="radio"/>	<input type="radio"/>
Navigated trip (used GPS to find route)	<input type="radio"/>	<input type="radio"/>
Thought or planned (e.g. about the day, a meeting, etc.)	<input type="radio"/>	<input type="radio"/>
Played a game (non-electronic)	<input type="radio"/>	<input type="radio"/>
Played a game (electronic)	<input type="radio"/>	<input type="radio"/>
Wrote or edited (part of) a document (paper)	<input type="radio"/>	<input type="radio"/>
Wrote or edited (part of) a document (electronic)	<input type="radio"/>	<input type="radio"/>
Read (paper)	<input type="radio"/>	<input type="radio"/>
Read (electronic)	<input type="radio"/>	<input type="radio"/>

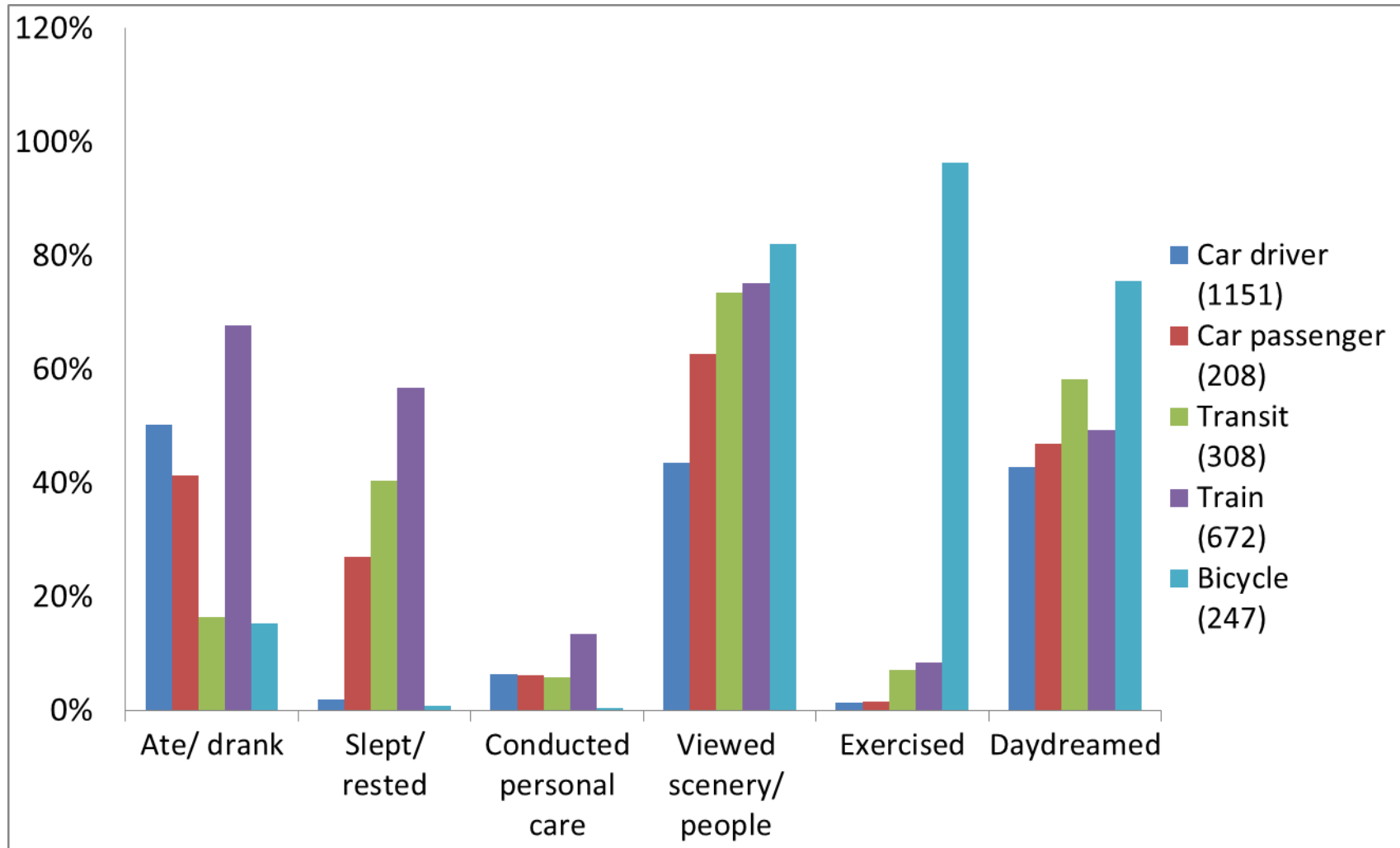
Activities conducted while commuting (by primary commute mode; N=2586)

	Car driver	Car passenger	Transit	Train	Bicycle
Ate/drank	50%	41%	16%	68%	15%
Slept/rested	2%	27%	40%	57%	1%
Conducted personal care	6%	6%	6%	13%	0%
Viewed scenery or "people-watched"	44%	63%	74%	75%	82%
Exercised	1%	2%	7%	9%	96%
Daydreamed	43%	47%	58%	49%	76%

Activities conducted while commuting (by primary commute mode; N=2586)



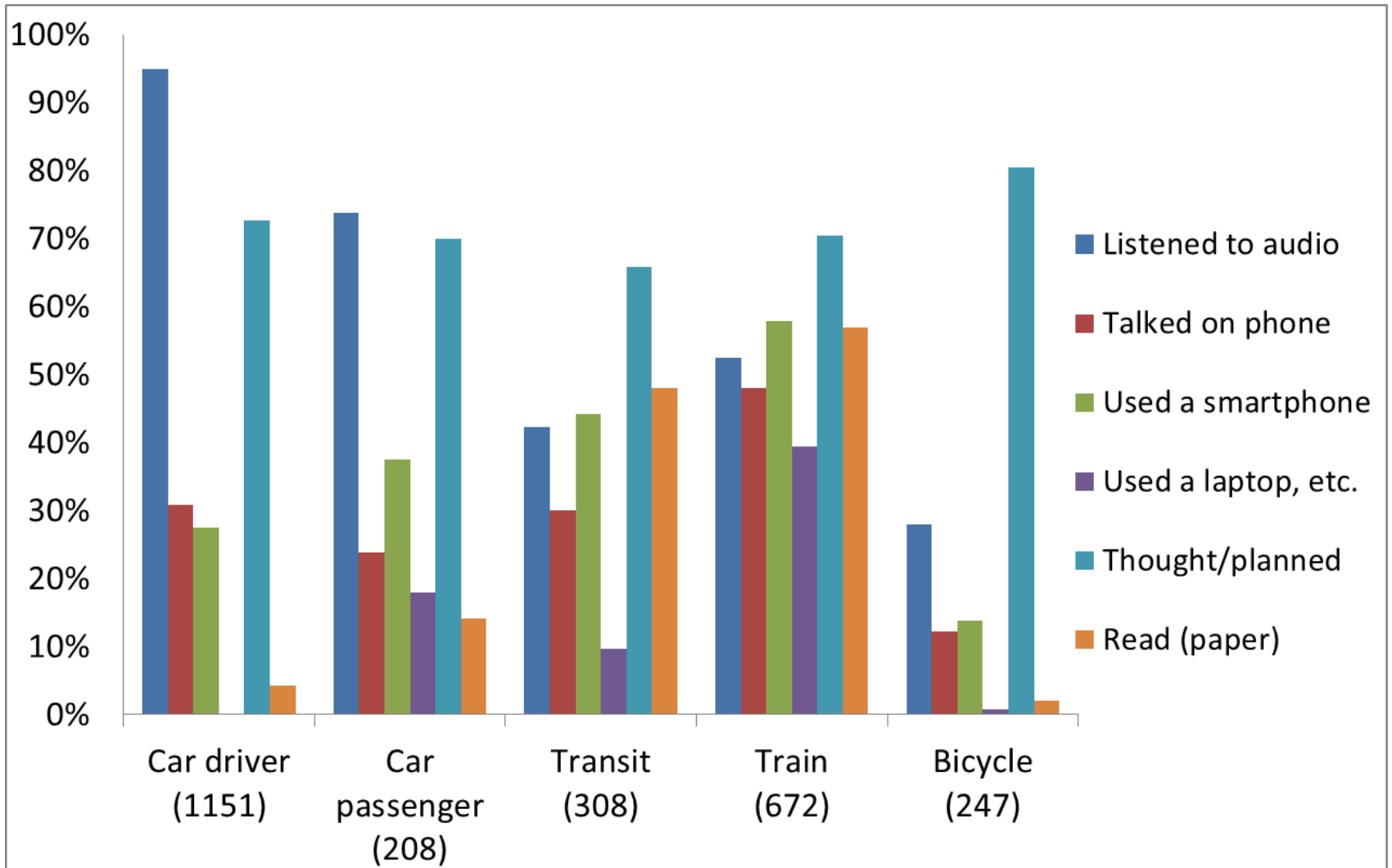
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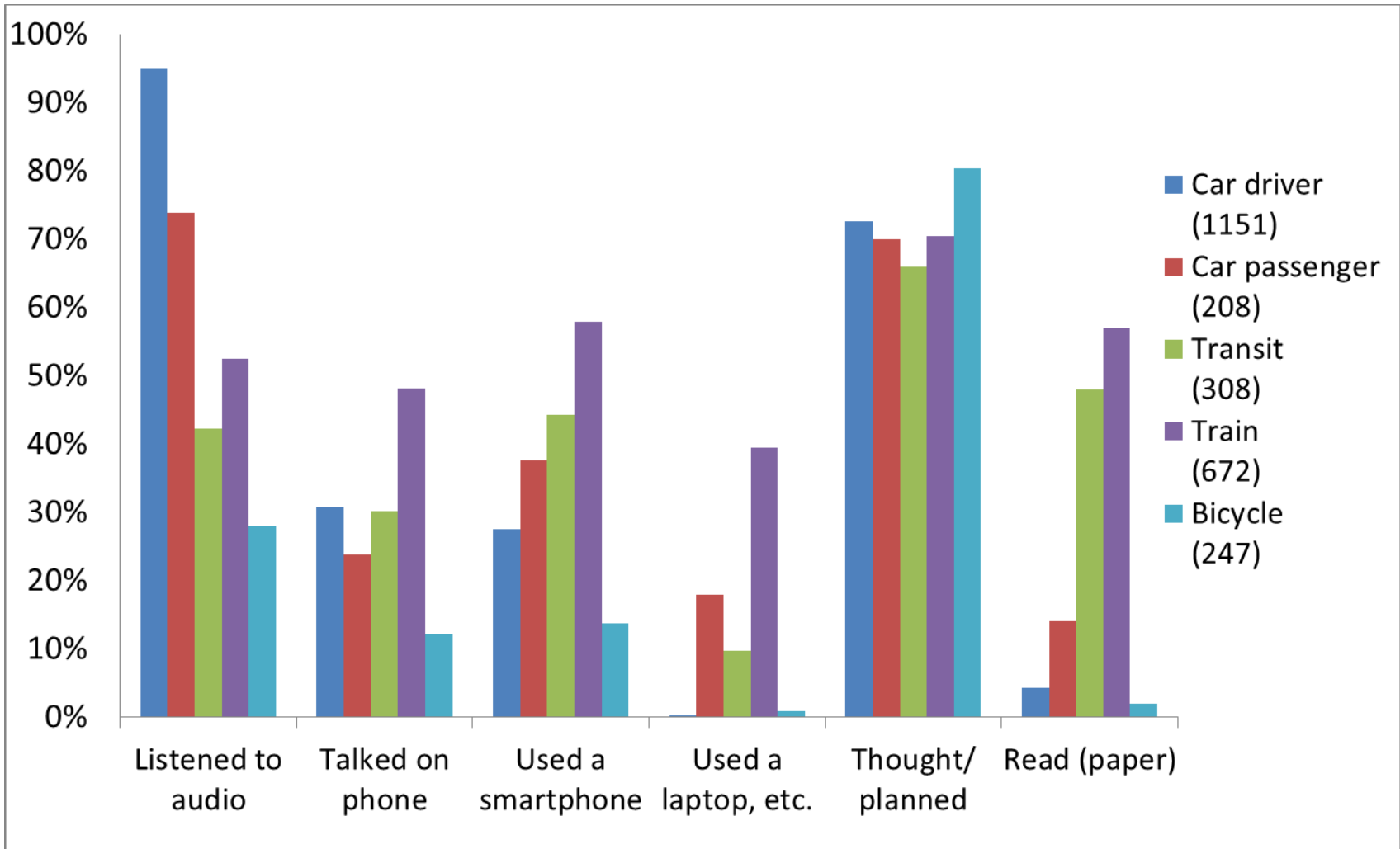
Activities conducted while commuting (by primary commute mode; N=2586)

	Car driver	Car passenger	Transit	Train	Bicycle
Listened to music/audio	95%	74%	42%	53%	28%
Talked on the phone	31%	24%	30%	48%	12%
Used a smartphone	28%	38%	44%	58%	14%
Used a laptop, netbook, or tablet computer	~0%	18%	10%	39%	1%
Thought/planned (e.g., about the day, a meeting, etc.)	73%	70%	66%	70%	80%
Read (paper)	4%	14%	48%	57%	2%

Activities conducted while commuting (by primary commute mode; N=2586)



Activities conducted while commuting (by primary commute mode; N=2586)



Factor analysis of activities conducted on a recent commute

- 23 different activities
- Factor analysis revealed 5 factors:
 1. **Technological** – usage of smartphone and associated activities
 2. **Recreational** – solitary relaxing activities
 3. **Productive** – using a laptop for writing and reading electronic documents
 4. **Traditional** – activities that don't involve digital technology
 5. **Maintenance** – activities associated with personal maintenance

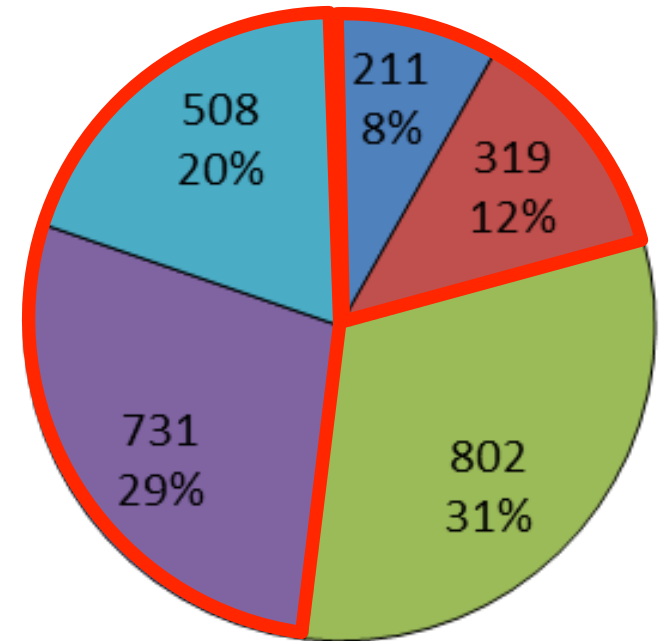
Results were used to inform creation of ***dummy variables for conducting any one or more of an empirically-related cluster of activities.***

Factor analysis of attitudinal traits and lifestyles

- 39 attitudinal items, 9 factor scores:
 1. *Pro-transit*
 2. *Necessity of travel*
 3. *Pro-technology*
 4. *Commuting advantage*
 5. *Time pressure (reality)*
 6. *Time pressure (preference)*
 7. *Pro-active (non-motorized) modes*
 8. *Personal satisfaction (with life, job)*
 9. *Pro-density*
- Similarly, other factor scores were computed for lifestyles and personality traits in the dataset

Dependent variable: SVTT

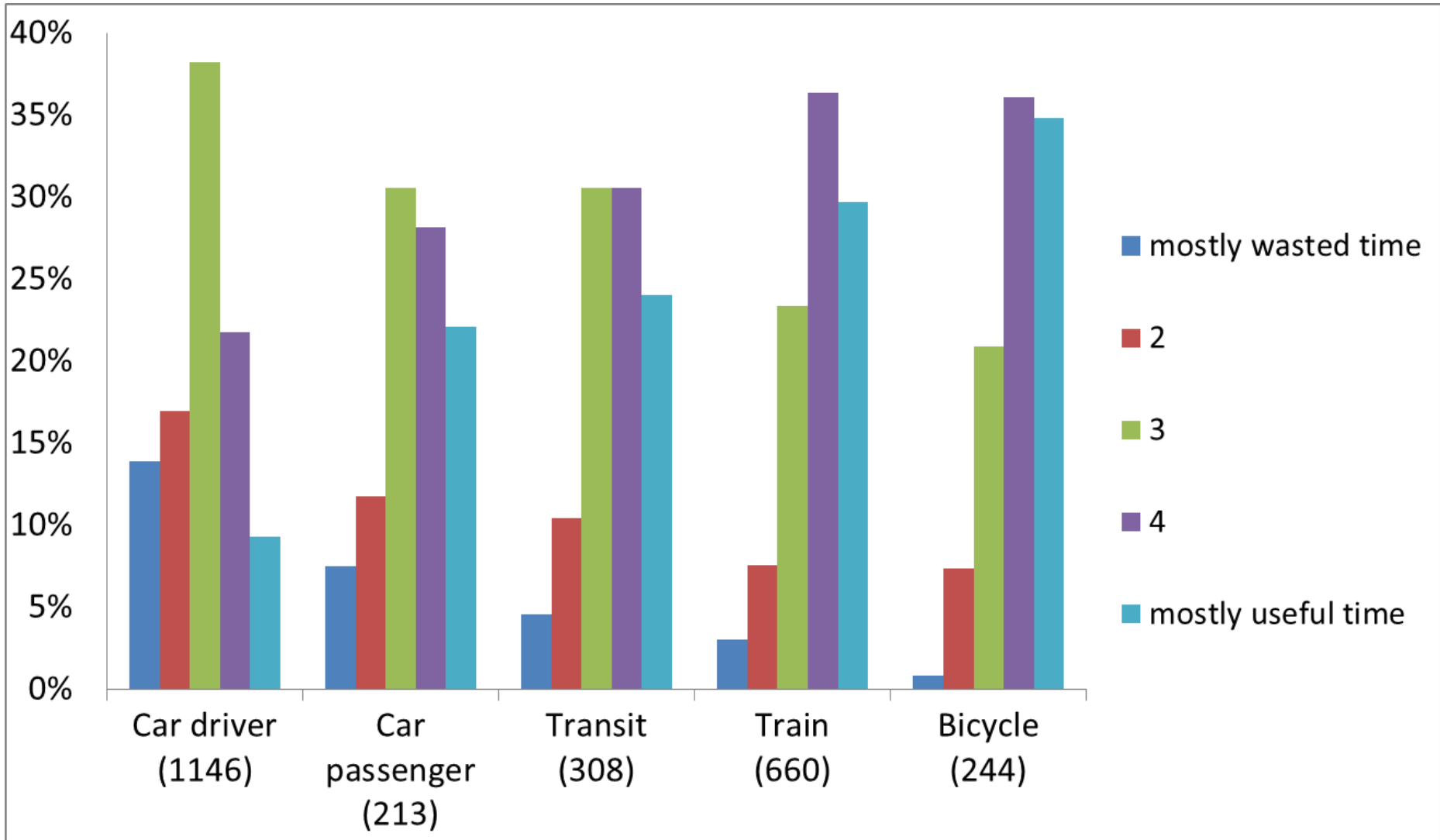
- “In terms of its *value to you*, how would you rate the time you spent on this recent commute?” Susilo et al. (2012)
 - Only 20% saw it as wasted
 - Nearly half saw it as useful
 - Not necessarily the *preferred* way of spending time, but people can make good use of the time they *must* spend
 - May be less inclined to reduce travel time



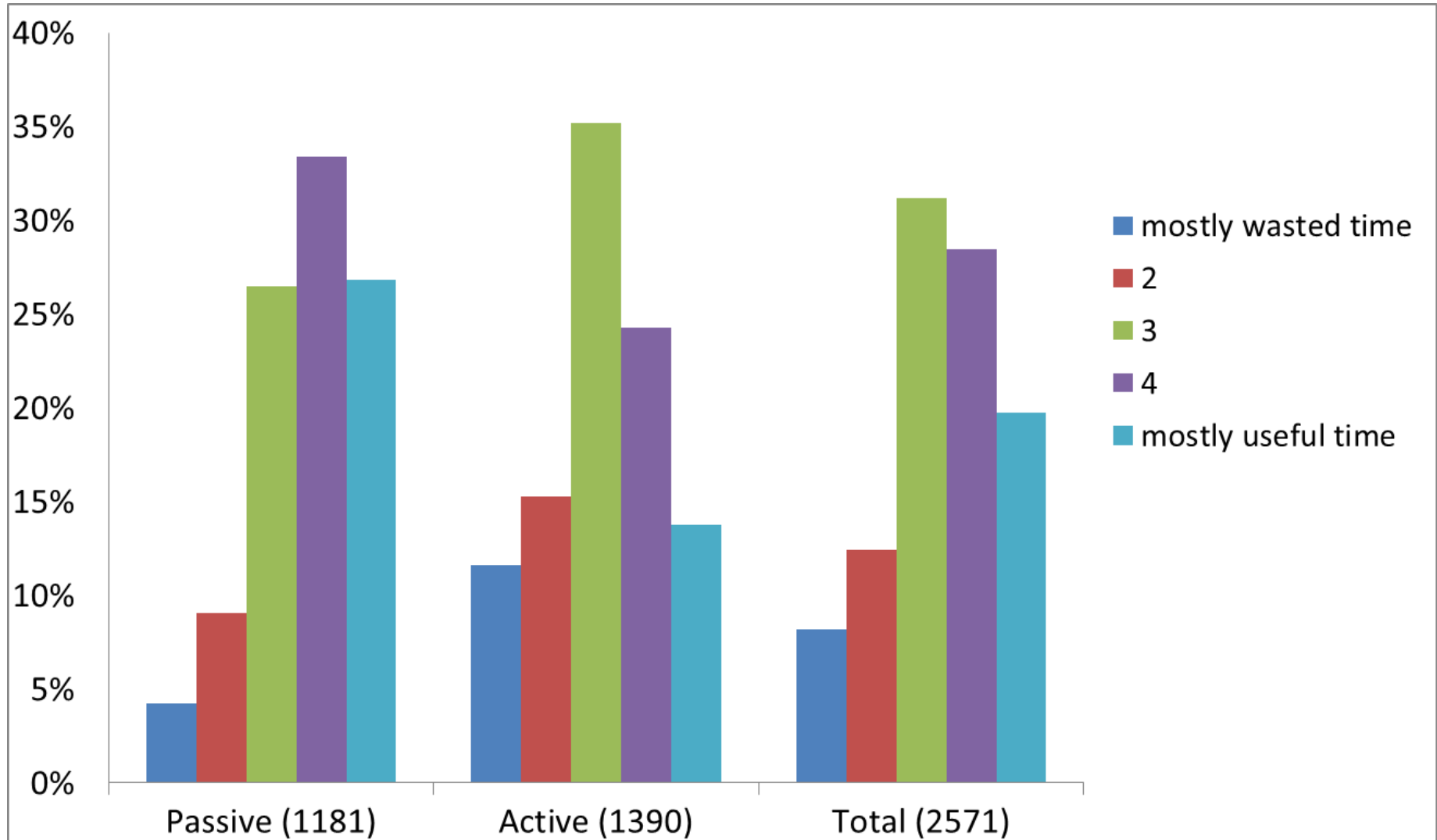
■ Mostly wasted time
■ 2
■ 3
■ 4
■ Mostly useful time

N= 2571

SVTT by primary commute mode



SVTT by passive-a vs. active-a mode



Model estimation

- **Ordinal probit** models of subjective valuation
 - Distinguishing between *passive-attention* and *active-attention* modes

PASSIVE-A

Car/vanpool passenger

Express bus

Local bus

BART

Commuter rail

Taxi

Ferry

ACTIVE-A

Motorcycle driver

Motorcycle passenger

Car driver

Bicycle

Walk

Subjective valuation of travel time (ordered probit) (1)

	PASSIVE-A MODES	ACTIVE-A MODES
VARIABLES	Coeff.	Coeff.
Personal Traits		
<i>Age</i>	0.010***	
<i>Professional/technical occupation</i>	0.140**	
<i>Distance (miles) to work</i>		-0.005***
General Attitudes/Personality		
<i>Commute is a welcome transition between home and work</i>	0.246***	0.310***
<i>Pro-technology</i> ^(a)		-0.106***
<i>Pro-transit</i> ^(a)	0.145***	
<i>General life satisfaction</i> ^(a)	0.102***	0.071**
<i>Pro-density</i> ^(a)	0.066**	
<i>Pro-active (non-motorized) transportation modes</i> ^(a)		0.073**
<i>Explorer</i> ^(a)	0.112***	
<i>Extrovert</i> ^(a)		0.071**

(a) Factor scores from Section A of the survey

Subjective valuation of travel time (ordered probit) (2)

	PASSIVE-A MODES	ACTIVE-A MODES
VARIABLES	Coeff.	Coeff.
Attitudes toward Time Use		
<i>Perception of excessive time spent for leisure/social activities^(a)</i>		0.124***
<i>Perception of excessive time spent working^(a)</i>		-0.125***
<i>Expected to work during commute</i>	0.179***	
<i>Likes to work during commute</i>		-0.080**
Attitudes toward Waiting and Multitasking		
<i>Unexpected wait time is unpleasant/wasted time^(b)</i>	-0.189***	-0.189***
<i>Waiting is a useful transition^(b)</i>	0.192***	0.136***
<i>Enjoys multitasking^(c)</i>	0.090***	0.113***

(a) Factor scores from Section C.3 of the survey

(b) Factor scores from Section D of the survey

(c) Factor score from Section B.2 of the survey

Subjective valuation of travel time (ordered probit) (3)

	PASSIVE-A MODES	ACTIVE-A MODES
VARIABLES	Coeff.	Coeff.
Activities while Commuting		
<i>Traditional (paper) productivity</i> ^(a)	0.195***	
<i>Electronic productivity</i> ^(b)	0.236***	
<i>Eat/drink</i>	0.327***	-0.189***
<i>Relax</i> ^(c)	-0.236***	0.259***
<i>Sleep/rest</i>		0.573***
Sample Size and Goodness of Fit		
<i>Sample size (N)</i>	1163	1426
<i>Pseudo-R²</i>	0.121	0.103
<i>LL (final)</i>	-1453.270	-1941.097

(a) DV for doing any of the following activities while commuting: playing non-electronic game, reading (paper), writing (paper)

(b) DV for using a laptop, using an e-reader, playing an electronic game, writing (electronic)

(c) DV for viewing scenery, daydreaming, exercising, watching a movie (leisure), non-electronic game (leisure)

Conclusions

- Most people don't see commute time as wasted
- Importance of influential factors differs between passive-attention and active-attention modes
- Activities conducted while traveling DO affect the perceived usefulness of travel time
- In particular, some activities (e.g. working on a laptop or reading) significantly increase the perceived usefulness of travel time on passive-attention modes
 - Caveat: results are conditional on chosen mode
 - Companion study is developing a mode choice model

Future research

With this dependent variable:

- Explore *taste heterogeneity*, e.g. segment based on gender, income, occupation, perceived (dis)benefits of commute multitasking

With the same data set:

- Evaluate impact of multitasking on *VOTTS*
- Use mode choice model to inform assessments of *impacts of autonomous vehicles*
- Enrich our understanding of *types of polychronicity*

Additional data collection:

- Conduct an *international comparison*

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**University of California
Transportation Center**



**UC Davis Sustainable
Transportation Center**



**Georgia Institute of
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School of Civil and
Environmental Engineering**



**Capitol Corridor Joint
Powers Authority**

THANK YOU!

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