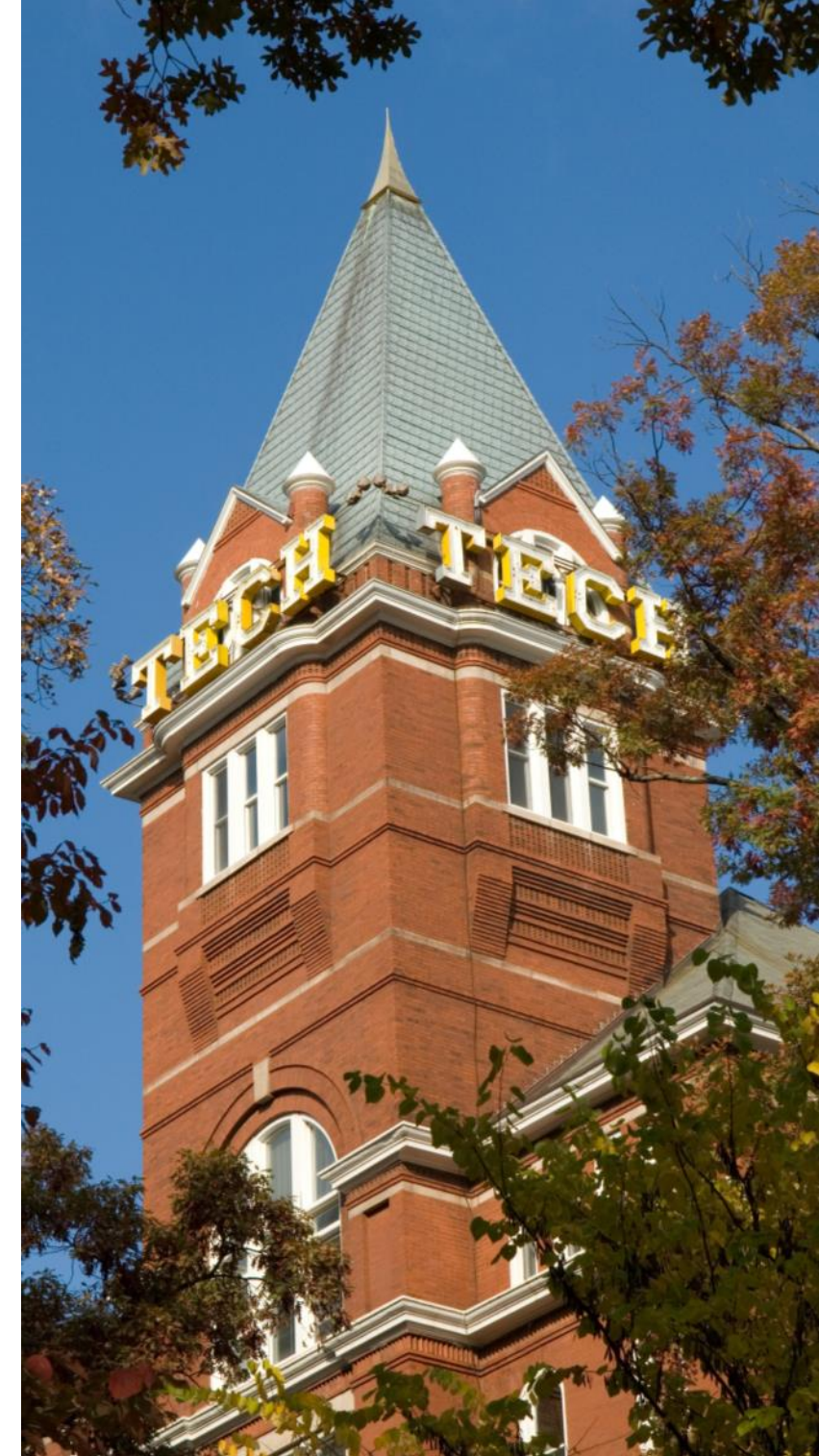


# Community Mobility in Senior Adults: The Coming Revolution

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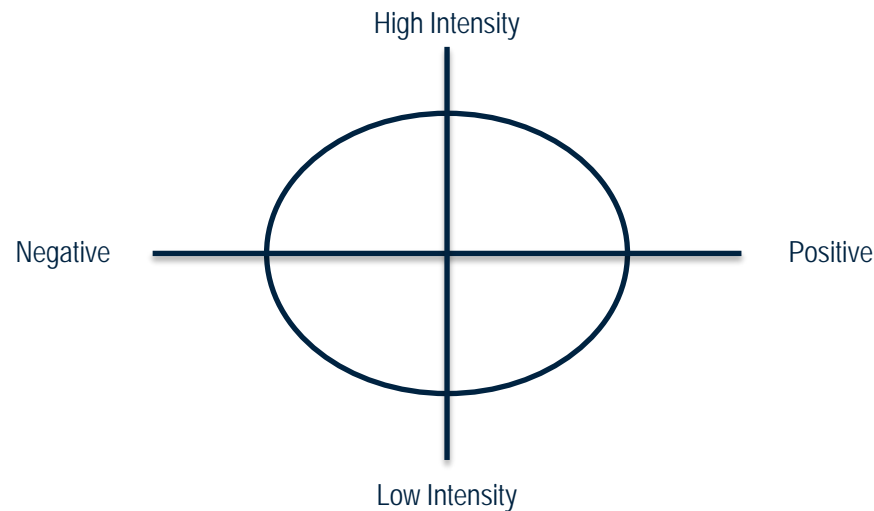
# Overview

- Community mobility and subjective well being in senior adults
- The spectrum of technologies that will lead to autonomous ground transportation (“self-driving cars”)
- The portal-to-portal problem: “Driving Miss Daisy”
- An aggressively optimistic outlook – and research agenda!

# HomeLab Community Mobility Survey 2014

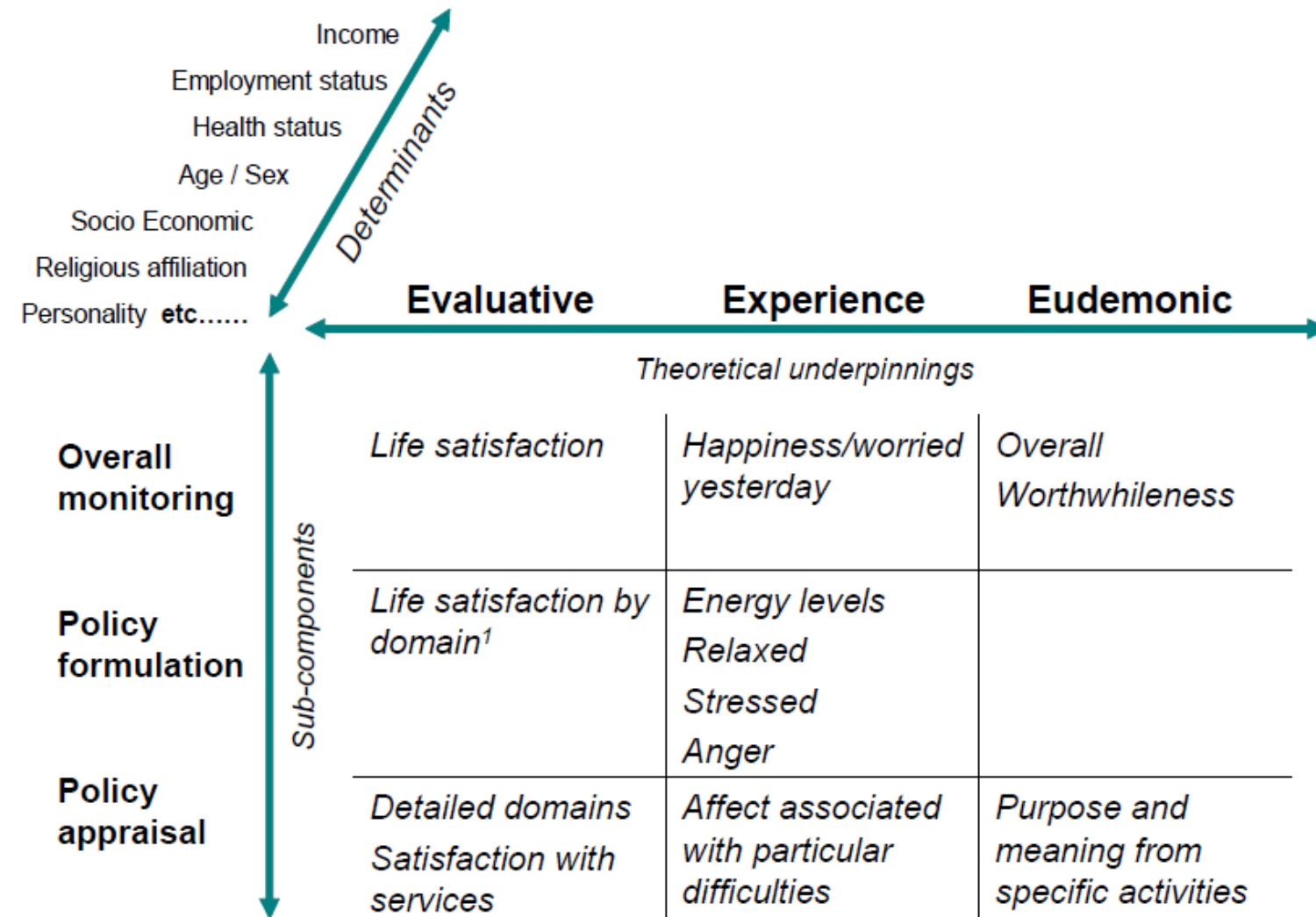
- Sent to 600+ HomeLab participants, received 383 completed surveys returned
- Addressed general community mobility, and specifically transportation to healthcare
- About 2/3rds have driven an automobile in the past year, and almost all of those drive regularly
- Questions about level of comfort in various situations (e.g., driving at night, driving on the freeway, driving on unfamiliar streets, backing up, etc.)
- Particularly interested in relationship between community mobility and subjective well being

# Subjective Well Being (SWB)



## Primary Components

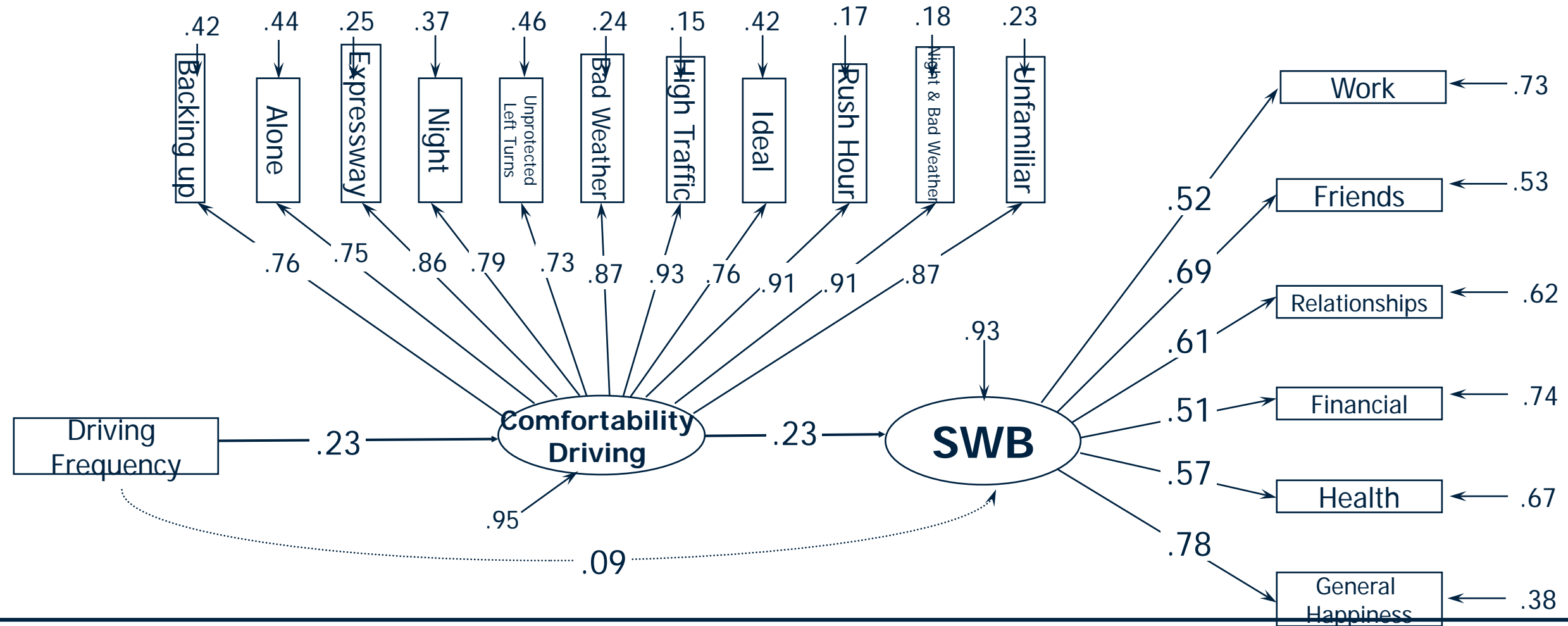
- Affective experience
- Cognitive appraisal
- Global life judgment
- Domain-specific satisfaction



1. Planned domains include: Personal relationships, physical health, mental well-being, work situation, financial situation, area where you live, time you have to do the things like doing, wellbeing of your children (if any).

Framework adapted and developed from Dolan, Layard and Metcalfe (2011) & Smith (2011) OECD, unpublished.

# Frequency, Comfort While Driving, and SWB



This model displays the mediating effect of a person's level of comfort driving has between driving frequency and subjective well-being. When including the mediator of driving comfort, the direct effect of driving frequency on subjective well-being, which was previously significant, is no longer statistically significant. Therefore, this model displays these combination of effects: increasing driving frequency increases level of comfort driving, which in turn increases subjective well-being.

# Technology Evolution

- From the first mass-produced automobiles in the early 1900's through the 1980's, technology improved so that less physical strength and dexterity was needed to drive successfully.
  - Electric starters rather than hand-turned cranks
  - Automatic transmissions, power steering and brakes, etc.
- In the 1980s through ~ 2010, computer technology improved performance but didn't greatly impact requirements for driver performance (exception: anti-lock brakes)
- Since ~2010, new technologies in cars are greatly increasing performance and safety

# Technologies that Lead to Autonomous Capabilities

- Adaptive Cruise Control (ACC) and automatic emergency braking give speed control and some degree of collision avoidance
- Lane departure warnings and lane keeping capability provide steering accuracy in well marked roadways
- Onboard navigation systems and communications systems give route planning, route monitoring, and alternate routing capability
- Blind spot indicators and backup cameras with alerts help avoid common accidents
- Proximity warning and other parking-assist technologies help with parking in confined spaces

# Near Horizon

- Improved computer vision systems – better analysis of complex roadway geometries, parking lots, and off-main-road driving
  - Passive scene analysis and active 3-D sensing with Lidar, radar, ultrasound
- Better databases of points of interest and attributes of those places salient to transportation (e.g. pick-up / drop-off points, wheelchair ramps, etc.)
- In-vehicle monitoring of driver (operator?) state
- Automated platooning



# Far Horizon

- Fleets of driverless taxis
- Privately owned motor pools of autonomous cars
  - New “automobile clubs”?
  - New employment benefits?
  - New forms of public transportation?
- These will allow for autonomous ground transportation that does not need an operator-in-control to be inside the vehicle
  - Will possibly result in command and control centers that remotely monitor the fleet and intervene as needed

# Portal to Portal Transportation

- Trip planning outside the vehicle
- Egress from point of origin (e.g., home or work) and transfer of packages and personal effects
- Ingress into the vehicle
- In-route trip monitoring and modifications
- Egress from the vehicle, transfer of packages and personal effects
- Ingress into the destination
- Planning the return trip

# “Driving Miss Daisy”

- Assistance with each physical step in portal-to-portal transportation
- Assistance with contextual issues in transportation planning
  - “Is this the best time to make this trip”
  - “Can we combine multiple trips into one”
  - “Remember you need to go to the doctor today”
- Social connectedness during transportation
- Monitoring of physical health during the trip
- Monitoring SWB related to community mobility

# A Rosy Future - Phase 1

- Technologies that will lead to self driving cars will help senior adults and people with other functional limitations be safer drivers, and to maintain higher levels of comfort and confidence while driving
- Increased capability for independent living and participation in activities outside the home

# A Rosier Future – Phase 2

- Greatly reduced cost of transportation, within the community, across metropolitan regions, and between regions
- Ability of people who cannot drive at all to arrange for and use personal transportation with safety and dignity
- Greatly increased safety and security during transportation

# After the Revolution

- Private automobile ownership mostly for hobbyists
- Enormous amounts of wealth will be created – and destroyed – by the new market forces that will be unleashed
  - Transformation of work, play, and community participation
  - Productive and leisure time will be increased, due to decrease in time lost to the monotony of the commute
- Lives of senior adults and people with disabilities will be greatly enriched by the increase in community mobility, in wellness monitoring, and in social connectedness facilitated by autonomous ground transportation

# Research Agenda

- Determine and design features of self-driving cars that are essential to successful adoption by senior adults
  - Otherwise these cars will be designed by geeks for geeks
- Consider the broad range of human experience with self-driving cars:
  - As in-vehicle operator, as passenger, as pedestrian, as remote controller
- Determine and design the set of complementary capabilities needed to provide portal to portal transportation and to fulfill the vision of “Driving Miss Daisy”

# For More Information

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