## The commuting habit loop: The role of satisfying existence, relatedness and growth needs in modal choice

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## Background

Understanding the motivators of habitual travel is essential for designing effective transport policies and interventions for promoting and maintaining sustainable travel trends.
Habitual travel is a steady behavior that affects the travel decision-making on a recurrent basis, conceptualized as the learning of a sequence of actions that have become default in response to certain situations
Previous studies investigated various conceptualizations of habitual travel in order to improve its epresentation in travel demand models.
ther studies viewed habit formation as a transition from preference-based choices to scriptbased choices by relying on positive perceptions of the travel experience to reinforce the value of past choices and trigger the same choices repeatedly.

## Research objective

This study proposes a novel view of the relationship between habit formation and the Theory of Planned Behavior (TPB) that is consistent with psychological theories on habit form
binds together the current knowledge on this relationship into one cohesive framework.

- We postulate habit formation in travel mode choice as a feedback-based recurrent process that relies on the sense of well-being and motivated by satisfying human needs. We incorporate multi-modality into the habit formation process by taking a bird-eye view and looking at weekly travel trends focusing on the commute trip.


## Behavioral framework

- Habitual choices, or script-based choices, are formed when people make preference-based choices, receives a positive outcome or reward as feedback, develop a feeling of satisfaction memorize the learning outcome, and retrieve it when they encounter the next similar situation. Thode choice is evalluated the context of the commute mode choice where the satisfaction with relatedness and personal growth needs (ERG), and subject to attitudes, norms and trave difficulties from the TPB.



## Methodology

Data for the study were collected through an on-line survey tailored to the behavioral framework The survey consisted of four parts: (i) general travel habits and commute characteristics; (ii) ERG constructs; (iii) TPB constructs; and (vi) individual characteristics. Eirg and PB constructs wer
tailored to the commute mode choice context. The questionnaire was distributed on-line to commuters in the Greater Copenhagen Area in June 2016. Respondents were recruited through 6,000 firms, university networks and social media allowing for a large and heterogeneous group of commuters at modest costs. The survey yielded 1,481 complete responses.
The data were analyzed by use of factor analysis (Principal axis factoring with orthogonal Varimax rotation). Travel frequency, travel satisfaction and the ERG and TPB constructs were analyzed by structural equation modelling using Mplus v7.2

## Factor analysis

The existence, relatedness and growth needs and the travel difficulties were obtained via exploratory factor analysis resul
$56 \%$ of the variance in the data.

## $\mathrm{KMO}=0.884$ Cronbach'salpha $=0.792$

| F1- Positive cycling self-concepts |  |
| :---: | :---: |
| It is important for me to get exercise | .53 .10 .31 -13 .07 .42 -04 |
| It is important for me to get fresh air |  |
| I feel mentally strengthened when I 1 bike |  |
| II feel on top and with good energy when I bike | 89 .08 .11 -08 -05 .16 -02 |
| l enjoy challenging myself physically when I bike |  |
| 1 I feel good about myself when I bike | 85 .05 .10 -14 -03 .19 -01 |
| Ifeel good about contributing to the environment when I bike |  |
| F2- Travel togetherness |  |
| It is important for me to travel with my colleagues | 00 .78 .10 .07 .02 -09 -05 |
| It is important for me to spend quality time together with other people |  |
| It is important for me to brin//collect others on the way | 02 .08 -11 -00 .09 -06 -01 <br> 0       |
| It is important for me to exercise with friends | .10 .85 .05 .06 .04 .05 .07 |
| It is important for me to talk about a shared hobby with people that are important to me | .05 .86 .07 .11 .02 -.00 .05 |
| It is important for me to particicipate in joint activities at work, e.g. bike to work campaigns |  |
| It is is important for me to be part of a bicycle culture | $\begin{array}{lllllllll}.21 & .77 & .10 & .04 & -00 & .10\end{array}$ |
| F3-Car use functional difficulties |  |
| \|ti is important for me to save money | $\begin{array}{llllllll}.17 & .09 & .40 & -02 & .27 & .09 & .13\end{array}$ |
| It is important for me to avoid driving stress |  |
| It is isportant for me to avoid road congestion | .12 .01 .47 -04 .29 .10 -08 |
| It is important for me to avoid worrying about parking | 04 .05 .51 .03 .25 .09 .00 |
| I believe it is is important not to contribute to congestion | .30 .13 .36 -11 .07 -.01 -09 |
| Transit is inacessible to me |  |
| Oriving a car is too expensive |  |
| Searching for parking takes too long | 05 .00 .64 -08 -08 .12 .00 |
| Driving a car is too stresstul |  |
| Driving a car is too dangerous |  |
| Driving a car is too unreliable (congestion) | . 07 -.01 .66 -6 -21-.13-.03 -.00 |
| F4-Positive car self-concepts |  |
| \|live life to the fullest when I drive my car (e.g.g by listening to music) | -06 .09 -24 .67 .16 -15 |
| Driving a car is a cool way to travel | $\begin{array}{llllllll}-13 & .06 & -14 & .83 & .08 & -11\end{array}$ |
| Oriving a car makes me feel optimistic and high-on-life | -.11 .09 -11 .88 .08 -10 |
| Driving a car makes me feel that I get the most out of every situation | $\begin{array}{llllllll}-.16 & .01 & -27 & .76 & .14 & -17 & .10\end{array}$ |
| Ifeel more independent when Idrive a car |  |
| F5-Satisfying functional needs |  |
| \|t is is important for me to arrive safely | .02 .07 .08 .06 .53 -10 -06 |
| It is important for me to carry my things | $\begin{array}{lllllllll}-02 & .01 & -05 & .13 & .57 & -12 & -02\end{array}$ |
| It is important for me to save time | $\begin{array}{llllllll}-.02 & .02-.15 & .00 & .50 & -.12 & .11\end{array}$ |
| It is important for me to go wherever and whenever I want | $\begin{array}{llllllll}.00 & .04 & -17 & .12 & .48 & .07 & .19\end{array}$ |
| It is important for me to have privacy during my transport | $\begin{array}{llllllll}-10 & .15 & .05 & .27 & .31 & -.17 & .06\end{array}$ |
| It is important for me to avoid congestion in transit | $\begin{array}{llllllll}.07 & .02 & .17 & .11 & 51 & .16 & .34\end{array}$ |
| It is is important for me to avoid having to change transport mode / line | $\begin{array}{llllllll}-02 & .04 & .04 & .09 & .57 & .06 & .27\end{array}$ |
| It is isportant for me to arrive on time |  |
| F6-Cycling self-efficacy |  |
| Biking is difficult because of the weather ( $R$ ) |  |
| Biking is isificiult because of the terrain ( $R$ ) | $.23-10$ -06 -21 -.06 .68 -08 |
| Biking is difficult because of the distance ( R ) |  |
| Biking is dangerous due to other trafic (R) |  |
| F7- Functional difficulties in transit |  |
| Transit is too slow | -04 -01 -39 .03 .18 -16 |
| Transit is too expensive Tranit is too crowded |  |
| Transit is unreliable |  |

## Structural equation mode

Modal shares for respondents were $42 \%$ for car, $31 \%$ for bicycling, and $17 \%$ for public transport. - Satisfaction levels were higher for car (59\%) and bicycle (62\%) than for public transport (34\%). Strong correlation between travel use frequency, ERG needs, travel difficulties, and satisfaction. - Cycling satisfaction is positively correlated with cycling self-concepts and self-efficacy, and negatively with car self-concepts.
Car satisfaction is positively correlated with car self-concepts and transit use difficulties, an negatively correlated with car use functional difficulties and cycling self-efficacy.

- Transit satisfaction is positively correlated with functional difficulties in car use, and negatively



## Key findings

Confirmation of a habitual feedback loop.
Travel mode frequency relates to satisfaction through needs satisfaction and travel difficulties. Important for transport systems to satisfy both functional and higher-order needs.

## Future work

Hybrid choice model of mode choice with latent ERG factors.
Focus on other trip purposes to check consistency.
Use of panel data instead of cross-sectional data for analyzing mode changes.

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