Transportation (2011) 38:1–15
DOI 10.1007/s11116-010-9283-z

Subjective well-being related to satisfaction with daily travel

Cecilia Jakobsson Bergstad · Amelie Gamble · Tommy Gärling · Olle Hagman · Merritt Polk · Dick Ettema · Margareta Friman · Lars E. Olsson

Published online: 27 May 2010

Abstract Previous research demonstrates an impact on subjective well-being (SWB) of affect associated with routine performance of out-of-home activities. A primary aim of the present study is to investigate whether satisfaction with daily travel has a positive impact on SWB, either directly or indirectly through facilitating the performance of out-of-home activities. A secondary aim is to determine whether emotional-symbolic or instrumental reasons for car use results in higher satisfaction with daily travel than other travel modes. A survey of a population-based sample of 1,330 Swedish citizens included measures of car access and use, satisfaction with daily travel, satisfaction with performance of out-of-home routine activities, and affective and cognitive SWB. The results confirmed that the effect on affective and cognitive SWB of satisfaction with daily travel is both direct and indirect via satisfaction with performance of activities. Percent weekly car use had a small effect on satisfaction with daily travel and on affective SWB, although fully mediating the effect of satisfaction with performance of the activities. This suggests that car use plays a minor role for satisfaction with daily travel and its effect on SWB. This role may be larger if investigated after a forced reduced car use.

Keywords Daily travel · Car use · Satisfaction · Subjective well-being

C. J. Bergstad · A. Gamble · T. Gärling (✉)
Department of Psychology, University of Gothenburg, P.O. Box 500, 40530 Göteborg, Sweden
e-mail: Tommy.Garling@psy.gu.se

O. Hagman
Section for Science and Technology Studies, University of Gothenburg, Gothenburg, Sweden

M. Polk
Human Ecology, School of Global Studies, University of Gothenburg, Gothenburg, Sweden

D. Ettema
Department of Human Geography and Planning, Utrecht University, Utrecht, The Netherlands

M. Friman · L. E. Olsson
The Service and Market Oriented Transport Research Group (SAMOT), Karlstad University, Karlstad, Sweden

Introduction

Utility-maximization theory is the dominant account of how travel-related choices of activity, destination and travel mode are made (McFadden 2001). Utility-maximization theory is also used to assess people's satisfaction with their travel (e.g. in cost-benefit analyses). Utility for the appraisal of policies, or for investigating the consequences of people's travel choices in general, is thus derived from observed choices. However, it is doubtful whether utility derived in this way is a valid measure of travellers' satisfaction, since choices are frequently made under constraints and lack of complete information.

As an alternative to utility, subjective well-being (SWB) has been proposed as a measure of individuals' benefits in a number of domains (Kahneman 1999). SWB expresses individuals' cognitive and emotional well-being, directly measured by means of reliable psychometric scales (e.g. Diener and Suh 1997). Since SWB refers to satisfaction with life in general, it is assumed to be relatively stable across time and to go beyond, but implicitly include, domains such as family life, work life, and leisure. Yet, there is an increasing interest in understanding how SWB is affected by context-specific factors such as various forms of consumption as well as quality of public goods including commuting services (Diener and Seligman 2004; Diener et al. 2009). An important research question raised by Ettema et al. (2010) is whether and how changes in travel context (e.g. change of travel mode, change in the level-of-service of public transport) will cause changes in SWB. If it is possible to find such a relationship with travel context, SWB would potentially be a powerful tool for policy appraisal.

Diener et al. (1985) posited that SWB consists of three components, positive affect (PA) and negative affect (NA) of immediate experiences, and a cognitive component of satisfaction with life as a whole. The affective components (PA and NA) may be assessed by immediate self-reports of specific emotions or mood (Stone et al. 1999). In these methods participants report their affective experiences *during* an episode or activity. Yet, Kahneman et al. (2004) and Schwartz et al. (2009) showed that ratings from memory of emotions associated with recent activities are highly correlated with the results of immediate methods. An alternative is therefore conventional self-report rating scales such as the *Positive and Negative Affect Scale* (Watson et al. 1988) or the *Swedish Core Affect Scale* (SCAS, Västfjäll et al. 2002; Västfjäll and Gärling 2007) used to measure past affective SWB (e.g. how people felt last week or feel on the whole) or current mood (how people feel at the moment). Cognitive SWB may be assessed by means of the 5-item *Satisfaction With Life Scal*e (SWLS) (Diener et al. 1985; Pavot & Diener 1993) or a single-item question (World Values Survey 2005).

At an individual level, both affective and cognitive SWB are partly explained by stable, possibly genetically influenced personality traits (Tkash and Lyubomirsy 2006), performance of goal-related activities (Deci and Ryan 2008; Waterman et al. 2008), and positive life circumstances (Lyubomirsky et al. 2005). People with a higher income have higher SWB (e.g. Clark and Oswald 1996; Ferrer-i-Carbonell 2005). Yet, SWB does not increase in proportion to an increasing income over time (Easterlin 2005). SWB usually has a U-shaped relationship to age (Diener and Suh 1997), being at its lowest when people are around the age of 40, and then gradually increasing. Marriage tends to increase, divorce or death of spouse to decrease SWB (Diener et al. 1999; Gove and Shin 1989). Education is positively correlated with SWB, although this has been found to be more pronounced in less wealthy countries (Argyle 1999). Unemployment has been shown to reduce SWB, in particular when there is little social support (Argyle 1999). The results for gender are mixed. Some studies show that women have higher SWB than men, others that there are no

differences, and still others that sex differences vary across the life course (Tesch-Römer et al. 2008). Although regional differences have been observed (Schimmack et al. 2008), no research seems to have explicitly investigated differences in SWB related to whether people live in urban, sub-urban or rural areas.

SWB can also be defined in the context of specific domains, such as work life, family life, and leisure (Schimmack 2008). A specific form of *domain-specific* SWB is customer satisfaction (Oliver 2009) that focuses on goods or services that fulfil specific needs. Satisfaction is a judgment that a service provides a pleasurable level of consumption-related fulfilment. Measuring satisfaction with travel services would entail travellers' judgments of their satisfaction with the whole or parts of the travel service. Customer satisfaction is less general than domain-specific SWB and only applies to those using the service.

Travellers' satisfaction is influenced by events experienced when using a travel mode. Friman and Gärling (2001) and Friman et al. (1998, 2001) demonstrated that both single critical incidents (incidents that deviate from users' expectations) and memory for their frequencies affect satisfaction with public transport service. In addition Friman (2004) found that different types of critical incidents elicited affective responses (described as changes in pleasantness-unpleasantness and activation-deactivation). On the basis of critical incidents frequently encountered when repeatedly using the service (such as daily travel), customers develop an accumulated satisfaction with the service. Customer satisfaction thus focuses on the experience during the use of the service itself. In a similar vein, research has recognised that travellers value the travel itself (Mokhtarian and Salomon 2001; Mokhtarian et al. 2001). For instance, Jakobsson Bergstad et al. (2010) and Steg (2005) investigated psychological reasons for car use including emotions evoked by driving a car (e.g. pleasure-to-use and freedom). Thus, driving affects people's mood and explains why the car is perceived to be attractive for many people. It has also been found that symbolic (self-presentation) aspects significantly contribute to the positive utility of driving (Mokhtarian and Salomon 2001). Stradling et al. (2007) found that satisfaction with bus services depends on a variety of non-instrumental factors such as cleanliness, privacy, safety, convenience, stress, social interaction, and scenery. It was furthermore found that pedestrians evaluated their walking trips in terms of non-instrumental criteria, such as crowdedness, air quality, presence of trees and flowers, presence of beggars, and type of pavement. Taken together, this research suggests that, independent of travel mode, a trip will result in a variety of affective responses, which will eventually affect satisfaction with the chosen travel mode. Customer satisfaction also has a cognitive component related to cost, travel time, and punctuality. Travellers will likewise develop a cumulative satisfaction with these aspects based on their repeated encounters with the service.

In summary, daily travel is itself likely to affect individuals' mood and lead to a cumulative satisfaction. Similarly as domain-specific SWB (Schimmack 2008), satisfaction with travel may impact on global SWB. Travel may also impact on global SWB in an indirect way. In travel behaviour analysis, it is acknowledged that travel is valued because it is instrumental for performance of daily activities. The activity-based approach in travel-behaviour research (Axhausen and Gärling 1992; Ettema and Timmermans 1997; Jones et al. 1983) emphasizes that the availability of travel options is an important determinant of how individuals and households schedule their activities in time and space, given the space–time constraints set by the environment (Hägerstrand 1970). For instance, Hildebrand (2003) found that mobility-impaired elderly engage in out-of-home activities less often than other elderly. Also when travel restrictions are less salient, the need to combine certain activities (e.g. dropping-off children and travel to work) may necessitate

the use of a certain travel mode (Lawton et al. 2008). In short, changes in travel options will influence the ease with which activities are performed, which may have indirect effects on SWB. In support of this assertion, Jakobsson Bergstad et al. (2009) showed that affect associated with the performance of a number of routine out-of-home activities during the previous week influenced weekly mood, affective SWB, and cognitive SWB. Thus, satisfaction with daily travel may also indirectly influence SWB.

A primary aim of the present study is to investigate whether satisfaction with daily travel has either a direct positive effect on SWB or an indirect positive effect by facilitating out-of-home activities (Ettema et al. 2010). A secondary aim is to determine whether the use of the car results in a higher satisfaction with daily travel than other travel modes, either for emotional and symbolic reasons (Jakobsson Bergstad et al. 2010; Steg 2005) or for instrumental reasons, due to the fact that car use facilitates performance of activities (Jakobsson 2007). We analyse data from a survey of a population-based Swedish sample in which measures are obtained of car access and use, satisfaction with daily travel, satisfaction with performance of out-of-home routine activities, and affective and cognitive SWB.

Method

Sample and procedure

Between October and November in 2007, a survey questionnaire and a free-of-charge return envelope were mailed to a sample of 3,000 Swedish residents, 1,000 randomly selected residents from each of urban areas with populations larger than 200,000 residents, semi-rural areas with populations between 20,000 and 200,000 residents, and rural areas with populations less than 20,000 residents. The respondents were offered tickets to a national lottery in compensation for their participation. A combined thank-you and reminder card was sent after approximately 1 week, which also gave the respondents an option to answer the questionnaire on the web. Fifty-six questionnaires were answered in this way. A total of 1,330 (44.3%) usable questionnaires were obtained, 543 (40.8%) from the rural areas, 536 (40.3%) from the semi-rural areas, and 196 (14.7%) from the urban areas.[1] In Table 1 sample descriptive obtained from the questionnaire are displayed separately for the three residential areas. Comparisons of these sample descriptives with population statistics (Statistics Sweden 2009) showed that the subsamples are representative for each of the three residential areas with respect to age, education, income and employment. The number of women in the sample and the number of respondents from cohabiting households exceeded the numbers in the population.

Questionnaire

The questionnaire consisted of seven modules. On the first page the respondents were informed that the general aim was to investigate people's well-being. The questionnaire took between 15 and 20 min to answer.

The following modules were included in the indicated order[2]: (1) Questions about instrumental, affective, and symbolic motives for car use (or for respondents who never

[1] Response rates usually differ between urban, suburban and rural areas.

[2] Some of the modules were included in the questionnaire for other purposes. The results for responses recorded in these modules are reported in Jakobsson Bergstad et al. (2009, 2010).

Table 1 Sample descriptives for respondents living in rural, semi-rural, and urban areas

	Rural areas	Semi-rural areas	Urban areas
Population	<20,000	20,000–200,000	>200,000
Sample size[a]	543	536	196
Women (%)	56.2	55.8	50.5
Mean age (M/SD)	47.7/12.9	44.1/13.3	41.0/13.3
Highest education (%)			
University	26.1	36.6	56.1
College	45.3	41.2	31.1
High school	19.6	12.5	6.2
Other	9.0	9.7	6.6
Annual household gross income, in '000 SEK[b] (%)			
<200	12.0	8.2	9.7
201–300	21.7	14.9	15.8
301–400	17.3	17.9	13.8
401–500	20.6	17.0	12.2
501–600	12.2	15.1	13.8
>600	8.3	18.7	27.0
Missing	7.9	8.2	7.7
Full-time employment (%)	51.9	53.1	57.7
% Employment (M/SD)	66.0/44.1	67.1/44.3	67.8/44.1
Household types (%)			
Single households with children	5.8	4.5	6.7
Single households without children	19.9	18.4	32.8
Cohabiting households with children	37.4	43.3	28.2
Cohabiting households without children	36.9	33.9	32.3
Housing condition (%)			
Detached house	60.7	50.0	17.9
Owned apartment	5.5	11.8	32.3
Rental apartment	11.8	16.0	35.4
Farm	11.8	8.4	.5
Other	10.2	13.8	13.9
Driving licence (%)	94.8	91.2	87.7
Car access (%)	94.2	91.0	75.4
# Cars in household (M/SD)	1.6/0.8	1.5/0.8	1.0/0.8
Weekly car use (%)	85.5	79.0	47.4
Estimated annual driving distance per person in km (M/SD)	15,588/14,523	15,410/14,824	15,899/23,701
Estimated annual driving distance per household in km (M/SD)	27,176/26,223	28,430/27.838	27,116/45,744

[a] Except for the income question, missing values did not exceed 4.1% for any question

[b] SEK 100,000 was approximately equal to EUR 11,000 or USD 14,000 at the time of the survey

used a car, motives for this); (2) Questions about daily travel; (3) Questions about the frequency of performing out-of-home activities and choice of travel mode for performing these activities; (4) Questions about affect associated with performing the activities;

(5) Measures of affective SWB; (6) Measures of cognitive SWB, and; (7) Questions about socio-demographic variables including sex, age, education, income, employment, household type, housing conditions, and car access and use.

Measures

Car use

The respondents were asked to report their mode choice for travel to nine categories of out-of-home activities performed previous week. The most frequently reported out-of-home activities in nationwide Swedish travel surveys (Swedish Institute for Transport and Communications Analysis 2007) were selected, including *work or study*; *purchases of non-durables*; *other purchases*; *participating in sports, exercise or outdoor activities*; *participating in out-of-home hobbies, religious, course or club activities*; *visiting relatives and friends*; *visiting restaurants, cafés or entertainment/cultural events*; *picking up or leaving children at school or day care centre*, and; *participating in children's leisure activities*. For each activity respondents reported how many times during the previous week (never, one, two, three, four, five, or more than five times) they had travelled by car (as driver or passenger) or used any other travel mode with the purpose of performing the activity. Percent weekly car use was obtained for each respondent as the percentage trips of the total number for which they used car as driver or passenger.

Satisfaction with daily travel

A *Satisfaction with Travel Scale* (STS) was developed and used to measure satisfaction with daily travel without focusing on any particular travel mode. A principal component analysis with varimax rotation resulted in retention of the following five statements with high loadings on the same factor: "*I am completely satisfied with my daily travel"*; "*My travel facilitates my daily life"*; "*When I think of my daily travel the positive aspects outweigh the negative"; "I do not want to change anything regarding my daily travel",* and; *"My daily travel makes me feel good"*. Respondents rated the statements on seven-point Likert scales ranging from 0 (do not agree) to 6 (agree completely). The STS was constructed by averaging the ratings of each item. Cronbach's alpha was .77, with inter-item correlations between .23 and .56. The lowest correlations were found for the statement "*My travel facilitates my daily life"* which was more instrumental in character than the other four items.

Satisfaction with activities

The short version of the *Swedish Core Affect Scale* (SCAS) (Västfjäll & Gärling 2007) was used to retrospectively measure what affect respondents felt while performing each of the activities they had performed at least once during previous week. Ratings were made of valence (unpleasantness–pleasantness) and activation (quietness–excitement) using two-seven-point scales ranging from 0 to 6. The end-points of the valence scale were defined by the three adjectives *sad, dissatisfied, depressed* and glad, *satisfied, joyful*, respectively, and the end-points of the activation scale *sleepy, passive, dull* and *awake, active, alert,* respectively. If an activity had been performed more than once, the respondents were asked to rate the most frequent affect associated with the activity. The correlation between the

ratings of valence and activation was $r = .77$ across all activities, and between .69 and .91 for each activity separately. A *Satisfaction with Activities Scale* (SAS) was constructed for each respondent by first averaging the valence and activation ratings for each activity, then averaging across all the performed activities (ranging from 1 to 9 different activities with a mean of 4.5).

Affective SWB and weekly mood

The same valence and activation rating scales were employed to measure affective SWB, both how the respondents felt last week (*weekly mood*) and on the whole (*affective SWB*). The correlations between the ratings of valence and activation were $r = .80$ for affective SWB, $r = .75$ for weekly mood. An average was computed across the valence and activation ratings.

Cognitive SWB

The assessment of cognitive SWB was made by the *Satisfaction with Life Scale* (SWLS) (Diener et al. 1985; Pavot and Diener 1993). SWLS consists of an average of the following 5 statements rated on seven-point Likert scales ranging from 0 (do not agree) to 6 (completely agree): *In most ways my life is close to my ideal; The conditions of my life are excellent; I am satisfied with my life; So far I have achieved the important things I want in life,* and; *If I could live my life over again, I would change almost nothing*. SWLS had a Cronbach's alpha of .90, with inter-item correlations between .54 and .79.

Data analyses

In line with the general aim of the research, the data analyses will first assess how much of the variance in satisfaction with daily travel (STS) is accounted for by car access and use, second how much of the variance in subjective well-being (weekly mood, affective and cognitive SWB) is accounted for by STS, and third whether the effect of STS on subjective well-being is direct, mediated or both direct and mediated by satisfaction with the activities the respondents performed (SAS). In the regression analyses that address these questions, a number of socio-demographic variables known to affect subjective well-being are controlled for.

Results

Affective SWB, weekly mood, and the Satisfaction with Activities Scale (SAS) were linearly transformed to values ranging from −3 to 3. Table 2 shows sample sizes (n), means (M), and standard deviations (SD) for cognitive SWB, affective SWB, weekly mood, SAS, STS, number of cars in household, and percent weekly car use. Product moment correlations between the variables are also reported. Kolmogorov–Smirnov's *d*s reported in the table indicate that the distributions deviate significantly from normal. These deviations are still minor (the measure ranges from 0 to 1) and, consistent with previous research (Diener et al. 1999), reflect that the distributions are negatively skewed (except for the positively skewed number of cars in household).

Table 2 Sample sizes (n), means (M), standard deviations (SD) and product moment correlations between measures

	n	M	SD	d[a]	1.	2.	3.	4.	5.	6.
1. Cognitive SWB	1,320	4.0	1.3	0.09						
2. Global affective SWB	1,313	1.3	1.2	0.16	0.64					
3. Weekly mood	1,320	1.0	1.3	0.13	0.56	0.68				
4. SAS	1,298	1.3	0.9	0.06	0.37	0.48	0.55			
5. STS	1,317	3.7	1.3	0.05	0.24	0.20	0.22	0.26		
6. # Cars in household	1,313	1.5	0.8	0.24	0.15	0.08	0.08	0.02	0.01	
7. Weekly car use (%)	1,290	76.8	33.4	0.32	0.06	−0.02	0.03	−0.06	0.08	0.47

Satisfaction with Travel Scale [STS] and cognitive SWB range from 0 to 6, with higher values indicating higher STS and cognitive SWB; Satisfaction with activities [SAS], weekly affective SWB, and global affective SWB range from −3 to 3, with negative values indicating negative affect and positive values positive affect

[a] All Kolmogorov–Smirnov's ds are significant at $p < 0.05$

An OLS multiple linear regression analysis was performed to determine the impact on STS of the number of cars in household and percent weekly car use. In order to control for possible confounding factors, the following socio-demographic variables were also entered as independent variables: sex (man 1 vs. woman −1), age (old age [55+years, 1] vs. young age [18–35 years, −1], and middle age [36–54 years, 1] vs. young age [18–35 years, −1]), cohabiting (1 vs. single −1), children (1 vs. no children −1), university education (1 vs. lower −1), income (1–6), employment (%), and residential area (urban [1] vs. rural area [−1], and semi-rural [1] vs. rural area [−1]). As Table 3 shows, percent weekly car use has a significant effect on STS. In conjunction with the socio-demographic variables only 2% of the variance is, however, accounted for. In the oldest age group STS is higher than in the youngest age group, whereas STS tends to be lower for households with children at home than for households with no children at home.

Table 3 OLS multiple linear regression analysis with satisfaction with travel (STS) as dependent variable, number of cars in household, weekly percent car use and socio-demographic variables as independent

	n	β	t	p
# Cars in household	1,313	−0.02	−0.61	0.545
Weekly car use (%)	1,290	0.08	2.49	0.013
Sex (man 1 vs. woman −1)	1,325	0.05	1.62	0.105
Age (36–54 years 1 vs. 18–35 years −1)	1,322	−0.03	−0.88	0.381
Age (55+ years 1 vs. 18–35 years −1)	1,322	0.14	4.13	<0.001
University (1 vs. lower −1) education	1,319	0.01	0.27	0.787
Employment (%)	1,313	0.03	1.15	0.249
Income (1–6)	1,211	0.03	1.02	0.310
Cohabitant (yes 1, no −1)	1,316	−0.03	−0.90	0.368
Children (yes 1, no −1)	1,318	−0.06	−1.89	0.059
Urban (1 vs. rural −1) residential area	1,275	−0.03	−0.65	0.515
Semi-rural (1 vs. rural −1) residential area	1,275	0.02	0.40	0.686
$R^2_{adj} = 0.02$, $F(12,1317) = 3.77$, $p < 0.001$				

A set of additional OLS multiple linear regression analyses was conducted with weekly mood, affective SWB, and cognitive SWB as dependent variables. STS, the number of cars in household, percent weekly car use and the sociodemographic variables were entered in the first step. As may be seen in Table 4, STS has significant regression coefficients with positive signs in all three analyses, although the coefficients differ slightly between weekly mood, affective SWB, and cognitive SWB. At the same time, the regression coefficients for sex, cohabiting, education, and employment tend to increase from weekly mood through affective SWB to cognitive SWB. The regression coefficients for the number of cars in the household and percent weekly car use are not significant, except that that the latter has a significant positive regression coefficient in the analysis of affective SWB. The results of the two age variables yield a U-shaped relationship with both affective SWB and cognitive SWB (lower SWB for the middle age group, 36–54 years). No age differences were obtained for weekly mood.

When in the second step SAS is entered, in all three analyses the regression coefficient for STS remains significant but decreases, whereas the significant regression coefficient for percent weekly car use is not significant. Sobel tests of significance showed that the relationship between STS and weekly mood, between STS and affective SWB, and between STS and cognitive SWB are all partially mediated by SAS ($z = 8.94$, $p < .001$, for weekly mood; $z = 8.55$, $p < .001$, for affective SWB; $z = 7.56$, $p < .001$, for cognitive SWB), and that the relationship between percent weekly car use and affective SWB is fully mediated by SAS ($z = 2.76$, $p = .006$).

Discussion

The present results show that the effect on affective and cognitive SWB of satisfaction with daily travel (STS) is both direct and mediated by satisfaction with performance of activities (SAS). Thus, the proposition by Ettema et al. (2010) is supported. Percent weekly car use that is instrumental for performance of activities had a small effect on STS and on affective subjective wellbeing (SWB), which was also fully mediated by the effect of SAS. In the present study car use thus played a marginal role for satisfaction with daily travel and its effect on SWB.

As shown by Jakobsson Bergstad et al. (2009), the effect on cognitive SWB of SAS is probably mediated by affective SWB. This may in particular pertain to the direct effects presumably caused by positive feelings (and absence of negative feelings such as stress due to time pressure), whereas the mediated, instrumental effects (e.g. due to performance of activities such as *work or school*) may at least to some extent be directly related to cognitive SWB.

Households unable to use a car may be satisfied with their daily travel because they have adjusted their activity schedule so that they have little need for multi-purpose multi-stop travel, for which the car is superior to other modes, or because they have chosen to live as to have access to satisfactory public transport services. Possibly speaking to the validity of this reasoning, older respondents and respondents with no children at home, both groups presumably having less complex travel needs, were more satisfied with their daily travel than younger respondents and respondents with children at home.

The present results do not necessarily warrant the conclusion that car access and use play no or little role for SWB. For households having access to a car, a forced reduction in car use may still have a large impact on SWB that has not been possible to assess. Gärling et al. (2002) discuss a number of difficulties that car-using households are likely to have in

Table 4 OLS multiple linear regression analyses with weekly mood, affective SWB and cognitive SWB as dependent variables, satisfaction with travel (STS), sociodemographic variables and weekly percent car use as independent variables in Step 1, and satisfaction with activities (SAS) added as independent variables in Step 2

Step 1	*n*	Weekly mood			Affective SWB			Cognitive SWB		
		β	*t*	*p*	β	*t*	*p*	β	*t*	*p*
STS	1,317	0.21	7.93	<0.001	0.20	7.35	<0.001	0.23	9.00	<.001
# Cars in household	1,313	0.03	0.90	0.367	0.06	1.90	0.057	0.06	1.80	0.072
Weekly car use (%)	1,290	−0.03	−1.05	0.295	−0.07	−2.04	0.041	0.00	0.06	0.950
Sex (man 1 vs. woman −1)	1,325	−0.01	−0.20	0.842	0.01	0.46	0.646	0.04	1.32	0.187
Age (36–54 years 1 vs. 18–35 years −1)	1,322	−0.01	−0.18	0.855	−0.09	−2.66	0.008	−0.09	−2.76	0.005
Age (55+ years 1 vs. 18–35 years −1)	1,322	0.03	1.01	0.314	0.03	1.03	0.303	0.03	0.80	0.423
University (1 vs. lower −1) education	1,319	0.01	0.34	0.736	0.02	0.60	0.547	0.05	1.72	0.085
Employment (%)	1,313	0.05	1.91	0.057	0.11	3.90	<0.001	0.10	3.58	<0.001
Income (1–6)	1,211	0.09	2.82	0.005	0.05	1.65	0.099	0.11	3.64	<0.001
Cohabitant(yes 1, no −1)	1,316	0.06	1.90	0.057	0.08	2.65	0.008	0.15	4.94	<0.001
Children (yes 1, no −1)	1,318	0.02	0.48	0.634	0.03	0.83	0.407	0.03	0.97	0.331
Urban (1 vs. rural −1) residential area	1,275	−0.04	−0.96	0.338	0.01	0.32	0.751	0.02	0.41	0.683
Semi-rural (1 vs. rural −1) residential area	1,275	0.02	0.42	0.671	0.01	0.21	0.831	−0.05	−1.37	0.172
Model		$R^2_{adj} = 0.07$, $F(13,1316) = 8.24$, $p < 0.001$			$R^2_{adj} = 0.07$, $F(13,1316) = 8.64$, $p < 0.001$			$R^2_{adj} = 0.13$, $F(13,1316) = 16.29$, $p < 0.001$		

Table 4 continued

Step 2	*n*	β	*t*	*p*	β	*t*	*p*	β	*t*	*p*
SAS	1,298	0.52	21.73	<0.001	0.44	17.46	<0.001	0.30	11.85	<0.001
STS	1,317	0.08	3.24	0.001	0.08	3.31	0.001	0.16	6.05	<0.001
# Cars in household	1,313	0.01	0.47	0.636	0.05	1.66	0.100	0.05	1.58	0.114
Weekly car use (%)	1,290	0.01	0.42	0.671	−0.03	−0.94	0.347	0.03	0.96	0.337
Sex (man 1 vs. woman −1)	1,325	−0.05	−2.00	0.045	−0.02	−0.92	0.360	0.01	0.42	0.676
Age (36–54 years 1 vs. 18–35 years −1)	1,322	−0.01	−0.33	0.739	−0.09	−3.05	0.002	−0.09	−2.99	0.003
Age (55+ years 1 vs. 18–35 years −1)	1,322	0.04	1.51	0.131	0.04	1.41	0.158	0.03	1.03	0.305
University (1 vs. lower −1) education	1,319	−0.01	−0.25	0.801	0.00	0.15	0.881	0.04	1.46	0.145
Employment (%)	1,313	0.06	2.29	0.022	0.11	4.39	<0.001	0.10	3.80	<0.001
Income (1–6)	1,211	0.05	1.81	0.070	0.02	0.66	0.519	0.09	3.02	0.003
Cohabitant (yes 1, no −1)	1,316	0.06	2.28	0.023	0.08	2.98	0.003	0.15	5.23	<0.001
Children (yes 1, no −1)	1,318	0.00	0.14	0.887	0.02	0.59	0.556	0.02	0.80	0.425
Urban (1 vs. rural −1) residential area	1,275	−0.03	−0.86	0.391	0.02	0.56	0.576	0.02	0.57	0.568
Semi-rural (1 vs. rural −1) residential area	1,275	0.02	0.76	0.449	0.01	0.45	0.654	−0.04	−1.29	0.197
Increment		$\Delta R^2_{adj} = 0.24$, $F(1,1315) = 472.04$, $p < 0.001$			$\Delta R^2_{adj} = 0.17$, $F(1,1315) = 304.84$, $p < 0.001$			$\Delta R^2_{adj} = 0.08$, $F(1,1315) = 140.30$, $p < 0.001$		
Augmented model		$R^2_{adj} = 0.31$, $F(14,1315) = 44.10$, $p < 0.001$			$R^2_{adj} = 0.24$, $F(14,1315) = 31.65$, $p < 0.001$			$R^2_{adj} = 0.21$, $F(14,1315) = 26.75$, $p < 0.001$		

adjusting to reduced car use. The contribution of the present research is to show that satisfaction with daily travel plays an important role for SWB, thus highlighting that a *reduction* in satisfaction with daily travel would have a negative impact on SWB. Reducing car use is likely to lead to such a reduction in satisfaction and thus to a reduction in SWB. In implementing hard or soft transport policy measures aimed at reducing car use, the present type of measures of satisfaction with travel and subjective well-being are clearly important to employ. Since previous research (see review of Frederick and Loewenstein 1999) has demonstrated the existence of adaptation to impaired conditions, implying that negative effects of daily travel on SWB may be nullified after some time, it is likewise important to assess these adaptation effects by means of repeated measurements over time. In Ettema et al. (2010) the policy implications of adaptation are discussed, in particular emphasizing the need to disentangle the time course as well as the costs of adaptation.

The measures of SWB have been used in numerous previous studies and are now well established. The new measure of a form of domain satisfaction developed in the present research, the Satisfaction with Travel Scale (STS), designed as a general measure of satisfaction with daily travel that could be used for any travel mode or combination of modes, was shown to be a reliable measure. Although the scale captures the two most distinct overall aspects (the cognitive and the affective) of satisfaction with daily travel, it may still benefit from further refinement by adding more specific elements of the two dimensions, such as stress, time-pressure, tiredness, and cognitive evaluations of high and low quality. Research on specific aspects of customer satisfaction is not new (e.g. Friman et al. 2001; Friman & Gärling 2001) but may be given a new fruitful direction by investigating its relationship to satisfaction with life in general. A refined version of the STS may here become a useful tool to compare different modes or other aspects of travel services to determine what factors that increases satisfaction with daily travel and thereby also subjective well-being.

Acknowledgements Financial support for this research was obtained by grant #AL90A 2006:16305 from the Swedish Road Administration through the program "Bilens sociala och ekonomiska betydelse" (Social and economic impacts of the automobile) (www.BISEK.se) to the Centre for Consumer Science, School of Business, Economics, and Law, University of Gothenburg, Sweden.

References

Argyle, M.: Causes and correlates in happiness. In: Kahneman, D., Diener, E., Schwarz, N. (eds.) Well-Being: The Foundations of Hedonic Psychology, pp. 353–373. Russell Sage Foundation, New York (1999)

Axhausen, K., Gärling, T.: Activity-based approaches to travel analysis: conceptual frameworks, models, and research problems. Transp. Rev. **12**, 323–341 (1992)

Clark, A.E., Oswald, A.J.: Satisfaction and comparison income. J. Public Econ. **61**, 359–381 (1996)

Deci, E.L., Ryan, R.M.: Hedonia, eudaimonia, and well-being: an introduction. J. Happiness Stud. **9**, 1–11 (2008)

Diener, E., Emmons, R.A., Larsen, R.J., Griffen, S.: The satisfaction with life scale. J. Pers. Assess. **49**, 71–75 (1985)

Diener, E., Lucas, R.E., Schimmack, U., Helliwell, J.F.: Well-Being for Public Policy. Oxford University Press, New York (2009)

Diener, E., Seligman, M.E.P.: Beyond money: toward an economy of well-being. Psychol. Sci. Public Interest **5**(1), 1–31 (2004)

Diener, E., Suh, E.: Measuring quality of life: economic, social, and subjective indicators. Soc. Indic. Res. **40**, 189–216 (1997)

Diener, E., Suh, E.M., Lucas, R.E., Smith, H.L.: Subjective well-being: three decades of progress. Psychol. Bull. **125**, 276–302 (1999)
Easterlin, R.A.: Feeding the illusion of growth and happiness: a reply to Hagerty and Veenhoven. Soc. Indic. Res. **74**, 429–443 (2005)
Ettema, D., Gärling, T., Olsson, L.E., Friman, M.: Out-of-home activities, daily travel, and subjective well-being (2010, Manuscript submitted for publication)
Ettema, D., Timmermans, H.J.P.: Activity-Based Approaches to Travel Analysis. Pergamon, Oxford (1997)
Ferrer-i-Carbonell, A.: Income and well-being: an empirical analysis of the comparison income effect. J. Public Econ. **89**, 997–1019 (2005)
Frederick, S., Loewenstein, G.: Hedonic adaptation. In: Kahneman, D., Diener, E., Schwarz, N. (eds.) Well-Being: The Foundations of Hedonic Psychology, pp. 302–329. Russell Sage Foundation, New York (1999)
Friman, M.: The structure of affective reactions to critical incidents. J. Econ. Psychol. **25**, 331–353 (2004)
Friman, M., Edvardsson, B., Gärling, T.: Perceived service quality attributes in public transport: inferences from complaints and negative critical incidents. J. Public Transp. **2**, 69–91 (1998)
Friman, M., Edvardsson, B., Gärling, T.: Frequency of negative critical incidents and satisfaction with public transport services. I. J. Retail. Consum. Serv. **8**, 95–104 (2001)
Friman, M., Gärling, T.: Frequency of negative critical incidents and satisfaction with public transport services. II. J. Retail. Consum. Serv. **8**, 105–114 (2001)
Gärling, T., Gärling, A., Loukopoulos, P.: Forecasting psychological consequences of car-use reduction: a challenge to an environmental psychology of transportation. Appl. Psychol. **51**, 90–106 (2002)
Gove, W.R., Shin, H.: The psychological well-being of divorced and widowed men and women. J. Fam. Issues **11**, 4–35 (1989)
Hägerstrand, T.: What about people in regional science? Reg. Sci. Assoc. Pap. **24**, 7–21 (1970)
Hildebrand, E.D.: Dimensions in elderly travel behaviour: a simplified activity-based model using lifestyle clusters. Transportation **30**, 285–306 (2003)
Jakobsson, C.: Instrumental motives for private car use. In: Gärling, T., Steg, L. (eds.) Threats to the Quality of Urban Life From Car Traffic: Problems, Causes, and Solutions, pp. 205–233. Elsevier, Amsterdam (2007)
Jakobsson Bergstad, C., Gamble, A., Gärling, T., Hagman, O., Polk, M., Olsson, L.E.: Affective-symbolic and instrumental-independence psychological motives mediating effects of socio-demographic variables on daily car use. J. Transp. Geogr. (2010, in press)
Jakobsson Bergstad, C., Gamble, A., Hagman, O., Polk, M., Gärling, T., Ettema, D., Friman, M., & Olsson, L.E.: Impacts of routine out-of-home activities on subjective well-being (Göteborg Psychological Reports No. 39:4). Department of Psychology, University of Gothenburg, Göteborg, Sweden. Downloadable from http://www.psy.gu.se (2009, in press)
Jones, P.M., Dix, M.C., Clarke, I., Heggie, I.G.: Understanding Travel Behaviour. Gower, Aldershot (1983)
Kahneman, D.: Objective happiness. In: Kahneman, D., Diener, E., Schwarz, N. (eds.) Well-Being: The Foundations of Hedonic Psychology, pp. 3–25. Russell Sage Foundation, New York (1999)
Kahneman, D., Krueger, A., Schkade, D., Schwarz, N., Stone, A.: A survey method for characterizing daily life experience: the day reconstruction method (DRM). Science **306**, 1776–1780 (2004)
Lawton, T.K., Frank, L., Bradley, M., Kavage, S., Chapman, J.: Urban form, travel time, and cost relationships with tour complexity and mode choice. Transportation **35**, 37–54 (2008)
Lyubomirsky, S., King, L., Diener, E.: The benefits of frequent positive affect: does happiness lead to success? Psychol. Bull. **131**, 803–855 (2005)
McFadden, D.: Disaggregate behavioral travel demand's RUM side—a 30 years retrospective. In: Hensher, D.A. (ed.) Travel Behavior Research, pp. 17–63. Elsevier, Amsterdam (2001)
Mokhtarian, P.L., Salomon, I., Redmond, L.S.: Understanding the demand for travel: It's not purely 'derived'. Innovation **14**, 355–380 (2001)
Mokhtarian, P.L., Salomon, I.: How derived is the demand for travel? Some conceptual and measurement considerations. Transp. Res. A **35**, 695–719 (2001)
Oliver, R.L.: Satisfaction: A Behavioral Perspective on the Consumer, 2nd edn. McGraw-Hill, New York (2009)
Pavot, W., Diener, E.: Review of the satisfaction with life scale. Psychol. Assess. **5**, 164–172 (1993)
Schimmack, U.: The structure of subjective well-being. In: Eid, M., Larsen, R.J. (eds.) The Science of Subjective Well-Being, pp. 97–123. Guilford Press, New York (2008)
Schimmack, U., Schupp, J., Wagner, G.G.: The influence of environment and personality on the affective and cognitive component of subjective well-being. Soc. Indic. Res. **89**, 41–60 (2008)

Schwartz, N., Kahneman, D., Xu, J.: Global and episodic reports of hedonic experience. In: Belli, R., Stafford, F., Alwin, D. (eds.) Calendar and Time Diary Methods in Life Course Research, pp. 157–174. SAGE, Thousand Oaks, CA (2009)
Statistics Sweden: Statistical database (on-line). Downloadable from http://www.ssd.scb.se (2009)
Steg, L.: Car use lust and must: Instrumental, symbolic and affective motives for car use. Transp. Res. A **39**(2–3), 147–162 (2005)
Stone, A.A., Shiffman, S.S., DeVries, M.W.: Ecological momentary assessment. In: Kahneman, D., Diener, E., Schwarz, N. (eds.) Well-Being: The Foundations of Hedonic Psychology, pp. 26–39. Russell-Sage, New York (1999)
Stradling, S.G., Anable, J., Carreno, M.: Performance, importance and user disgruntlement: a six-step method for measuring satisfaction with travel modes. Transp. Res. A **41**, 98–106 (2007)
Swedish Institute for Transport and Communications Analysis: RES 2005–2006: den nationella resvaneundersökningen (in Swedish) [TRAVEL 2005–2006: The national travel survey]. Swedish Institute for Transport and Communications Analysis, Stockholm. Downloadable from http://sika-institute.se (2007)
Tesch-Römer, C., Motel-Klingebiel, A., Tomasik, M.J.: Gender differences in subjective well-being: comparing societies with respect to gender equality. Soc. Indic. Res. **85**, 329–349 (2008)
Tkash, C., Lyubomirsy, S.: How do people pursue happiness? Relating personality, happiness-increasing strategies, and well-being. J. Happiness Stud. **7**, 183–225 (2006)
Västfjäll, D., Friman, M., Gärling, T., Kleiner, M.: The measurement of core affect: a Swedish self-report measure. Scand. J. Psychol. **43**, 19–31 (2002)
Västfjäll, D., Gärling, T.: Validation of a Swedish short self-report measure of core affect. Scand. J. Psychol. **48**, 233–238 (2007)
Waterman, A.S., Schwartz, S.J., Conti, R.: The implications of two conceptions of happiness (hedonic enjoyment and eudaimonia) for the understanding of intrinsic motivation. J. Happiness Stud. **9**, 41–79 (2008)
Watson, D., Clark, L.A., Tellegen, A.: Development and validation of brief measures of positive and negative affect: the PANAS scales. J. Pers. Soc. Psychol. **54**, 1063–1070 (1988)
World Values Survey: World Values Survey 2005–2006 Wave, Root version. Downloadable from http://www.worldvaluessurvey.org (2005)

Author Biographies

Cecilia Jakobsson Bergstad have a PhD in psychology and a position as Assistant Professor at the Department of Psychology, University of Gothenburg. Her main research interest focuses on environmental psychology and in particular factors related to motivation for use of private cars and ways to overcome barriers to changes in (reduction of) private car use and other environmentally significant behaviours.

Amelie Gamble is a researcher and lecturer in Decision Making at the Department of psychology, University of Gothenburg, Sweden. Her main research interest is subjective well being and emotions. Another area is the perception of money in different contexts within Economic psychology.

Tommy Gärling is Professor of Psychology part-time affiliated with University of Gothenburg, Karlstad University and Umeå University in Sweden. His main research area is behavioral decision making with applications to economic behavior, pro-environmental behavior and travel behavior.

Olle Hagman is lecturer in Science and Technology Studies at the Sociology Department, University of Gothenburg, Sweden. His main research areas are environmental sociology and technological choices, with applications to transportation and building technologies.

Dr. Merritt Polk is a researcher and lecturer at the University of Gothenburg, School of Global Studies. Her main research areas include gender, sustainable transportation, sustainable urban development and transdisciplinarity.

Dr. Dick Ettema is an associate professor in the Department of Geography of Utrecht University. His research interests include behavioural adaptation, social networks and the influence of ICTs on travel behaviour.

Margareta Friman Associate Professor, is director of the SAMOT (Service and Market Oriented Transport) research group at Karlstad University. Her main research area is consumer psychology.

Lars E. Olsson is PhD of Psychology at the Service and Market Oriented Transport Research Group (SAMOT) and the department of Psychology at Karlstad University in Sweden. His main research area is consumer behaviour with a focus on pro-environmental behaviour, daily travel, and its relation to subjective well-being.