Activity-travel participation, multitasking in travel and daily well-being

Nurul Fatihah Mohd Fauzi[1] and *Dimas* B. E. Dharmowijoyo[1,*]

[1]Civil and Environmental Engineering Department, Faculty of Engineering, Universiti Teknologi PETRONAS, Seri Iskandar, Malaysia

Abstract. Using hierarchical liniear regression and multi-dimensional three-week household time-use and activity diary, this study investigated the interaction among spatiotemporal variables on percentage time of engaging multitasking in travel, and how endogenous of percentage time of engaging multitasking in travel interact with other spatiotemporal variables on individuals' daily subjective well-being. Different from descriptive analysis result, the result in using hierarchical linear regression shows that having tighter time-space constraints tend to positively correlate with performing multitasking activities within travel more often. Moreover, the ones who peform more trips such as the youngest travellers and someone from middle income tend to perform multitasking activities in travel more often. Endogenous of percentage time of engaging multitasking in travel shows positive correlation on improving someone's daily well-being, as expected. In term of policy implication, undertaking passive leisure within travel can be suggested to improve someone's daily well-being. The opportunity to undertake passive leisure within travel can be an advantage of using public transport.

1 Introduction

Travel is needed by an individual for undertaking an activity at another/other place/s for fulfilling his/her need and desires. For instance, an individual has to go to the supermarket for groceries shopping. The groceries shopping is considered as the need for the individual and it cannot be done without travelling because the supermarket is located at different location and it requires him/her to travel even by walking. According to [1], travel is a permanent constraint that an individual must do to fulfil their life needs and desire.

In consideration of individual's daily activity-travel pattern, the interaction between individual's time-space needs and constraints are influenced by their personal and household socio-demographic characteristics and their socio-environmental conditions. The space-time or time-geographical framework is a wide and powerful perspective that analyses human behavior. This framework, originally developed by [1], focuses on the behavioral possibilities of individuals. By recognizing that individuals must operate within very basic spatial and temporal constraints on their behavior, the space-time framework can complement a wide variety of approaches to modelling human behavior in addition to aiding the planning and location of activities and infrastructure [1,2,3].

[1] argued that an individual is subject to three types of constraints which are capability constraints, coupling constraints and authority constraints. The constraints interact with individuals' needs and desires, and availability resources to shape an individual's daily time-space prism. The time-space prism shows individuals' daily activity participation. In participating some activities, individuals may move from one location to another/other location/s in which the time-space prism also demonstrates people's travel behavior. The framework recognizes that activity participation must be undertaken within spatial and temporal dimensions, for instance activities occur at specific locations for limited time periods. Transportation resources and built environment conditions allow the individuals to trade time for space to travel and participate in activities at different locations.

The consideration of multitasking is very significant and have important implications to the activity-travel behavior study. [4] noted that recording multitasking activities in time-use survey can reveal for around 160% of additional time for passive leisure and 50% for household activities. It really shows how people tends to optimize their time to do passive leisure and housework activities within tighter time and space constraints. Multitasking is defined as the simultaneous conduct of two or more activities during a given period of time. This definition embraces both type of multitasking which are natural and time-driven multitasking. Natural multitasking is a normal multitasking that most of the people do in everyday life for instance talking whilst eating or driving whilst listening to the radio whereas time-driven multitasking is usually prompted by time pressure [5].

---

* Corresponding author: fatihahfauzi280295@gmail.com

Multitasking is also defined as the concurrent activities which contained primary and secondary activities [6,7] in order to satisfy different needs and desires at the same time. Multitasking activities act as an influential variable in shaping individual's activity-travel pattern [8]. Different people has different level of time-space constraints and tend to perform multitasking activities within different activities [6,8,9]. Revealing the impact of multitasking activities on individual's degree of variability of activity-travel pattern will give another aspect in time-space perspective on how individuals optimize their time and space constraints in order to fulfill their needs and desires. When the secondary activities is taken into consideration, the full picture of how to optimize the tighter space-time prism could be observed. Multitasking study has shown that people with different socio-demographic backgrounds may have different degree on how often he/she participates secondary activities [9]. However, it rarely investigated the influence of people with different time-space constraints or different time-use participation on undertaking multitasking activities within a specific primary activity.

Travel is an activity that can be jointly undertaken with another secondary activity such as passive leisure [6]. Travel is considered to have moderate time and space constraints in comparison with grocery shopping and working [10]. Some research on how multitasking activities are undertaken in public transport has been revealed how public transport can offer another opportunity in undertaking more enjoyable activities such as socializing or working activities during travel with public transport [11,12].

[5] and [6] have mentioned that multitasking may be considered as opportunity, but it also can be a burden, which somehow can increase the stress level and decrease wellbeing by 'contaminating' primary activities or increasing pressure to participate where participation is undesirable. However, according to [11] and [12], when we have another activities in travel, wellbeing level can be increased. However, the previous study only focuses on investigating the impact of the inclusion of another/other activities during travel on individuals' travel experience and not in daily well-being. [13] highlighted that when someone has satisfaction in an activity, it will not directly influence daily well-being or daily satisfaction. Daily satisfaction/well-being is a cumulative satisfaction/well-being during a day as a result of undertaking various activity and travel. Improving the travel satisfaction is a thing, but improving daily well-being needs a contribution of various activities and travels. There is a possibility that undertaking multitasking within travel only improves individuals' travel satisfaction, but not in daily well-being, that is why investigation on the impact of undertaking multitasking activities during travel on daily well-being needs to be done. In investigating the impact on daily well-being, the interaction with participation and time duration of other activities and built environment condition is also included in conjunction with socio-demographic variables.

This paper focus to investigate the nature of multitasking within travel when including spatiotemporal variables such as time-use and activity participation and built environment condition. Moreover, the study also investigates the influence of multitasking within travel in interaction with other spatiotemporal variables on daily well-being. Spatiotemporal variables such as time-use and activity participation, built environment condition and socio demographic variables are assumed to shape either the nature of multitasking activities within travel and daily well-being. Passive leisure such as reading a book, enjoying scenery, socializing and listening to music is the only secondary activities assumed to be undertaken during travel in this study.

2 Bandung metropolitan area dataset 2013

The BMA dataset includes multi-dimensional information such as household, physical activity and lifestyle, individual's subjective characteristics, time-use and activity diary, and subjective wellbeing data. The dataset raises possibilities to analyze individuals' behavior in multi-dimensional perspectives.

The study included 732 respondents and 191 households from all over BMA for 21 sequential days. The surveys were conducted in Bahasa Indonesia as the local dialect of individuals in Indonesia. Because of poor enlistment of residents in Indonesia and other creating nations, the survey procedure began with direct interaction between surveyors and potential respondents, intervened by community pioneers in chosen neighborhoods. Accordingly, in the survey procedure, the study did not have any response rate data. After the association, the respondents were requested to sign a dedication letter concurring not to pull back from the survey until the point that it was finished. After signing the agreement, the surveyors started to distribute the questionnaires to the respondents. This process limited the steady loss of respondents in finishing the overview. In this study, none of respondents quit amidst overview time. Further explanation can be found in [14].

The household data section contained household composition, individuals' perception about how far his/her accommodation was from the city center, public and transportation facilities, and built environment variables. The subjective perception of accessibility was used in this dataset, rather than objective measurements, because the traffic conditions in BMA, like in other developing cities, are rather unpredictable and are frequently highly congested. Thus, a subjective perceived accessibility was considered as a better measurement to capture the accessibility to various activity locations available from individuals' residential locations. The profile of the samples used in this study is illustrated in Table 1.

Activity diary contained 23 activity participation classified into in-home mandatory, in-home maintenance, in-home leisure, out-of-home mandatory, out-of-home maintenance, out-of-home leisure and travel participation. Activities are categorised as mandatory when a particular activity is defined to be difficult to be re-scheduled [15] with higher temporal and spatial fixity such as working, going to school and pick up/drop activities [16]. Whereas, activities with higher temporal and spatial flexibility which can be easily re-scheduled is classified as discretionary activities such as maintenance and leisure activities [15,16].

[Type here]

Another activity classification included in this study is multitasking activities. In this study, multitasking is considered as undertaking secondary activity participation in conjunction with primary activity [6,7] for satisfying different needs and desires at the same time. Passive leisure such as listening to music, watching TV, checking internet and socializing was the only possible secondary activity accounted in this research. Passive leisure can be found to be combined with all type of activities such as in-home mandatory, in-home maintenance, in-home leisure, out-of-home mandatory, out-of-home maintenance and out-of-home leisure. For this research, adult respondents who have geographical characteristics and multitasking activities were included. It means that only around 534 respondents were included.

Table 1. Profile of the samples used in the study

Variables	Percentage or Mean
Socio-demographic characteristics at individual level:	
• Male	52.10%
• Worker and non-worker	43.64% and 31.05%
• Is a dependent children (<= 14 years old)	12.73%
• Age (continuous) (years old)	38.6
• Part of low income (< IDR 3 million/month) and medium income households (IDR 3-6 million/month)	75.20% and 15.80%
Household characteristics:	
• Number of household members	4.52
• Number of dependent children per household	0.83
• Number of motorised vehicles per household	1.77
• Reside within the inner city boundary of BMA and within Greater BMA	44.90% and 37.90%
Trips engagements and travel time spent on weekdays (weekends):	
• Number of trips	2.64 (2.29)
• Number of trip chains	1.26 (1.08)
• Percentage of using motorised mode	39.19% (36.77%)
• Percentage of using public transport	14.88% (9.55%)
• Percentage of using non-motorised mode	34.49% (32.08%)
• Total travel time spent from Monday-Friday (minutes)	74.87(69.35)
Time spent for different activities on weekdays (weekends):	
• Time spent for in-home mandatory activities (minutes)	693.17 (738.18)
• Time spent for in-home leisure & maintenance activities (minutes)	308.23 (363.09)
• Time spent for working/school activities (minutes)	298.85 (161.99)
• Time spent for out-of-home grocery shopping (minutes)	13.11 (21.62)
• Time spent for out-of-home social-recreational (minutes)	51.72 (61.52)
	5.04 (24.75)

Variables	Percentage or Mean
• Time spent for out-of-home other maintenance and sport (minutes)	
Percentage of time engaging with multi-tasking activities within certain activity on weekdays (weekends):	
• Percentage of time engaging with multi-tasking activities within travel activities	6.89% (5.22%)
Built environment variables:	
• Density of industrial and trade centre area per square-km within the respondents' residential location	0.0244 and 0.0048
• Density of government office and settlement area per square-km within the respondents' residential location	0.0120 and 0.4836
Perceived accessibility variables:	
• Perceived number of public transport lanes passing respondent's resident	2.57
• Perceived travel time to CBD and shopping centre area (minutes)	31.27 and 15.85
• Perceived travel time to grocery store and park (minutes)	8.34 and 18.29
• Perceived travel time to the nearest place to stop public transport (minutes)	14.50
Individuals' daily subjective well-being	5.12

Table 2. Model classification for activities criteria

Code	Activities Criteria	Classification
A	Sleeping at home	MANDI
B	Personal care at home	MANDI
C	Eating and drinking at home	MANDI
D	Relaxing activities at home	LEISI
E	Social and family activities at home	LEISI
F	Household activities at home	MAINTI
G	Babysitting activities at home	MAINTI
H	Indoor working activities	MANDO
I	Out-of-home social	LEISO
J	Outdoor working activities	MANDO
K	Sales activities from door to door, delivery something, purchasing activities	MAINTO
L	Indoor school activities	MANDO
M	Outdoor school activities	LEISO
N	Eating and drinking outside home	MANDO
O	Shopping activities	MAINTO
P	Organization/ Volunteer/ Political activities	LEISO
R	Sport activities	LEISO
S	Maintenance activities (out-of-home)	MAINTO

[Type here]

Code	Activities Criteria	Classification
T	Dropping/ picking up children/ other family members/ friends/ business partner and others	MANDO
U	Holiday	LEISO
V	Waiting for public transport	MAINTO
W	Other out-of-home activities	LEISO
Z	Out-of home sleeping	MANDO

3 Day-to-day individuals' multitasking activity participation

Each individual has his/her own travel behavior and each of them is different. The time-space prism can analyzes the human travel behavior where it can display the interaction between individual's time-space needs and constraints. The time-space needs and constraints are basically influenced by their personal and household socio-demographic characteristics and their socio-environmental conditions. Moreover, Figure 1 shows the distribution of day-to-day individual's percentage of undertaking multitasking activities for different socio-demographic variables. From Figure 1, it can be shown that individuals' participation on multitasking activities within travel is different from day to day. Participation of multitasking activities within travel is drop on Sunday and raising up again on Monday.
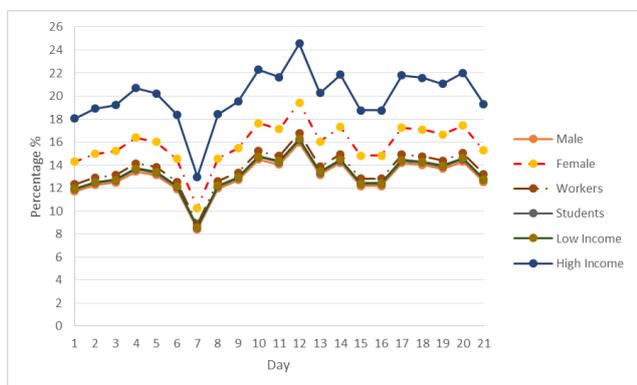

Fig. 1. Day-to-day individual's percentage of undertaking multitasking activities for different socio-demographic variables

From the graph, individuals that have high income had the highest percentage of doing multitasking in travel. Besides, female also have high percentage of doing multitasking in travel right after the individuals that have high income. Surprisingly, workers and students does not have much difference of percentages in doing multitasking in travel. Perhaps because they both need to multitask due to time and space constraints.

From the survey, the data is analyzed by plotting the graph of time used of activities against the multitasking activities in travel. Figure 2 shows the time used for out of home mandatory activities and time used for in home mandatory activities of individual with high and low percentage of doing multitasking. Out of home mandatory activities consist of activities like working, going to school or study place and dropping off children while the

example of in home mandatory activity is personal care. Based on the Figure 2, the ones who do high percentage of multitasking activities within travel are the ones who undertake longer time for in-home mandatory and out-of-home mandatory activities. It shows that the ones who have tighter time and space constraints for undertaking longer working/school time tends to do higher percentage of multitasking in travel.

Next, Figure 3 show the line graph of time used for out of home maintenance activity with high and low percentage of undertaking multitasking in travel. The example of out of home maintenance activity are going for grocery shopping or doing out of home personal care. The line graph shows that time used for out of home maintenance activities of individual that do multitasking for in home maintenance activity is the highest. This shows that the ones who undertake multitasking in travel is the ones who undertake longer time for in-home maintenance activities and grocery shopping.
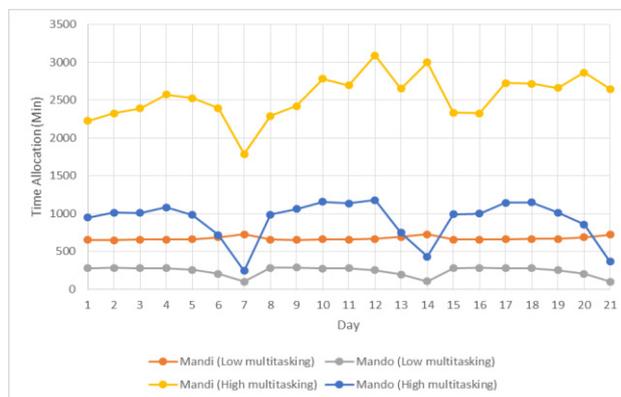

Fig. 2. Day-to-day individual's time use for undertaking mandatory activities of the ones who undertake low and high percentage time of engaging multitasking within travel
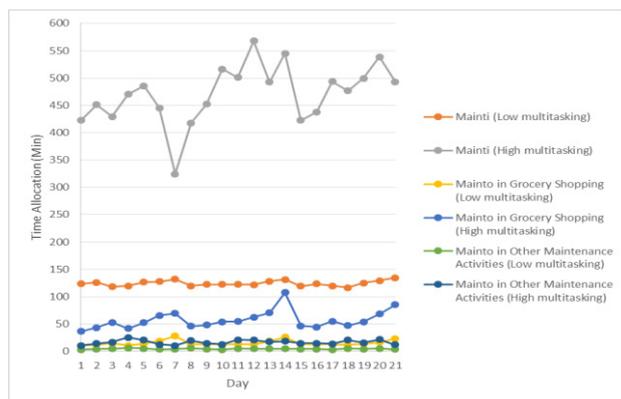

Fig. 3. Day-to-day individual's time use for undertaking maintenance activities of the ones who undertake low and high percentage time of engaging multitasking within travel

Furthermore, Figure 4 shows the line graph of time used for in home and out-of-home leisure activities of individuals with igh and low multitasking activities. The example of in home leisure activities are watching television, listening to radio and socializing with family members while the example for out-of-home leisure activities are participating in any other social activities

[Type here]

outside home and doing sports activities as well. Figure 4 shows that the ones with longer in-home leisure and out-of-home socializing time are the ones who have higher percentage of multitasking activities.

This chapter can show how individuals tend to have different day-to-day activity participation on different activities. Individuals tend to do longer mandatory activities time on weekdays and shorter on weekends, but the pattern is on other way around out-of-home discretionary activities such as socializing activities, sport, grocery shopping and other maintenance activities. It seems that the ones who undertake longer in-home activities either mandatory or discretionary tend to have higher percentage of undertaking multitasking within travel. It may mean that the ones who undertake higher percentage of multitasking within travel is not necessary the ones who have tighter time-space constraints such as longer working/school time and out-of-home discretionary activities. The ones who undertake longer in-home activities as most housewifes always do could do higher percentage of undertaking multitasking within travel.
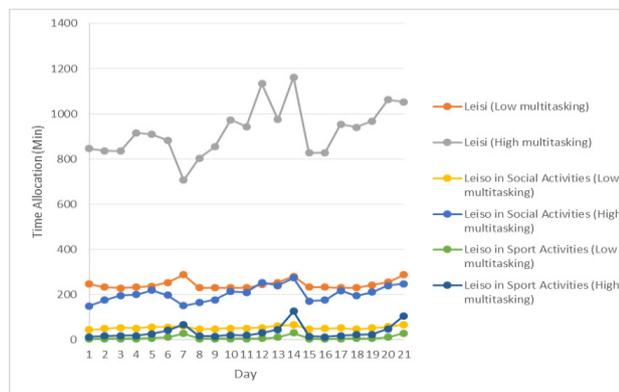

Fig. 4. Day-to-day individual's time use for undertaking leisure activities of the ones who undertake low and high percentage time of engaging multitasking within travel

4 The proposed model

The purpose of the proposed model structure is to better understand the relationships between spatiotemporal variables and the nature of undertaking multitasking in travel. Moreover, the endogenous multitasking activities within travel is assumed to interact with spatiotemporal variables to shape individuals' daily well-being. Built environment and perceived accessibility were also included in the analysis to show interaction with environment and individual perception towards environment [17]. For detail, Figure 5 shows the proposed model in this study.
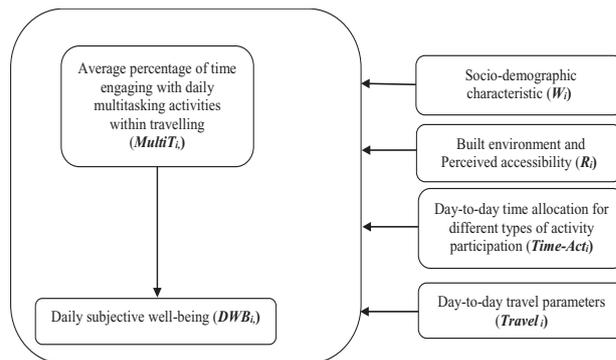

Fig. 5. Proposed Model Structure

Hierarchical liniear regression was used in this research. It means that for this research, the day-to-day variability of individuals' activity participation was ignored. However, the different daily variability of individuals' activity-travel participation can be acknowledged in different average time of a particular activity or travel participation. The idea of this research is just to show whether the endogeneity problem can be solved with the proposed model without including day-to-day variability. Without this method, the influence of day-to-day percentage of time engaging with multitasking activities within travel on daily well-being may not be seen due to correlation with other independent variables.

To more clearly show the model in Figure 5, with mathematical forms, Equations 1 to 2 were written as follow:

$$MultiT_{,i} = \boldsymbol{\beta_1} W_i + \boldsymbol{\beta_2} R_i + \boldsymbol{\beta_3} Time\text{-}Act_i + \boldsymbol{\beta_4}Travel_i + \mathcal{E}_1 \quad (1)$$

$$DWB_{i,} = \boldsymbol{\beta_1} W_{h,i} + \boldsymbol{\beta_2} R_i + \boldsymbol{\beta_3}Time\text{-}Act_i + \boldsymbol{\beta_4}Travel_i + \gamma_1 \widehat{MultiT_i} + \mathcal{E}_2 \quad (2)$$

5 Model estimation result

5.1 Multitasking in travel

Table 3 shows the variables that are significance to multitasking in travel. This means that these variable positively or negatively correlate with the tendency of individual to do multitasking in travel.

From the results, it shows that the workers tend to do more multitasking in travel compared to non-workers and students. Workers tend to have tighter time and space constraints than non-workers and students hence they need to do multitasking in travel to ease their work loads [1,2,3,18,19,20,21]. Moreover, the individuals with middle income have higher tendency to do multitasking in travel than the individual with high income. It is presumably because middle tends to do more trips [18,19,20]).

The result from occupation and income variables is inline with result from activity participation variables. The ones who have commitment to undertake longer out-of-home activities tend to perform high percentage time of engaging multitasking in travel. However, the result is opposite when someone has commitment to undertake

[Type here]

longer time for maintenance activities. As expected, when more advanced model is applied, people with tighter time-space constraints tend to do multitasking in travel more often than the ones with higher commitment to undertake in-home maintenance activities such as housewifes [1,2,3,18,19,20,21]. The magnitude is higher when someone has commitment to undertake out-of-home maintenance activities. Undertaking a planned discretionary activities such as out-of-home maintenance activities is not routine and might be considered as a planned discretionary activities whereas out-of-home leisure activities are considered as impulsive activities in Asia/Indonesia context [15,21]. It means that performing a planned discretionary activities tend to make travellers to have tighter time and space constraints. Therefore, it seems logic when undertaking a planned discretionary activity has a higher magnitude in undertaking multitasking more often than a routine out-of-home activities such as working and studying time at school, and an impulsive activity such as a leisure activity.

Furthermore, the results also showing the individuals that are using public transport are more likely to do multitasking in travel. This is the advantage of taking public transport than motorised mode. Undertaking public transport provide opportunities to undertake passive leisure while riding [10,12]. From perceived accessibility variables, it shows that having longer travel time to achieve basic amenities such as CBD, shopping centre and government office tends to make someone to take higher percentage time of engaging multitasking activities within travel. However, residing in an area farther from grocery store tend to make travellers to undertake less percentage time of engaging multitasking within travel.

Table 3. Model estimation result

Variables	Multitasking in Travel		Daily subjective well-being	
	Coeff	T-stat	Coeff	T-stat
Intercept	-30.394	12.591	6.120	11.972
Male (vs. female)				
Workers	9.494	2.832	0.291	3.367
Students	-12.452	6.075	0.380	2.519
Non-workers	Ref	Ref	Ref	Ref
Aged < 22	9.796	5.617		
Aged 23-45	-8.454	5.579		
Aged 45-55				
Age 55+	Ref	Ref	Ref	Ref
From low income household				
From middle income household	14.133	2.687		
From high income household	Ref	Ref	Ref	Ref
Number of household members				
Number of dependent child/children within household				
Access to motorised mode				

Variables	Multitasking in Travel		Daily subjective well-being	
	Coeff	T-stat	Coeff	T-stat
Resident of Greater BMA area (vs. central city)			0.457	2.403
Number of trips			-0.045	-2.202
Number of trip chains			0.066	1.942
Total daily travel time (minutes)				
Percentage of using motorised mode				
Percentage of using public transport mode	0.195	0.042	-0.005	-4.349
Percentage of using non-motorised mode			-0.001	-3.253
Time spent for in-home mandatory				
Time spent for in-home maintenance	-0.010	-2.669	-0.001	-1.988
Time spent for in-home leisure				
Time spent for out-of-home mandatory	0.031	10.974	-0.001	-1.995
Time spent for out-of-home social activities	0.010	2.543		
Time spent for grocery shopping	0.069	7.889	0.002	3.240
Time spent for other out-of-home maintenance	0.100	9.899		
Time spent for out-of-home sport activities			0.001	2.549
Percentage of time engaging with multitasking activities within travel	0.035	1.782		
Percentage of time engaging with multitasking activities within in-home mandatory	0.087	2.479	0.003	2.047
Percentage of time engaging with multitasking activities within in-home discretionary	0.132	4.714		
Percentage of time engaging with multitasking activities within working and studying activities	0.150	9.166		
Percentage of time engaging with multitasking activities within grocery shopping				
Endogenous of percentage of time engaging with multitasking activities within travel ($\widehat{MultiT}$)			0.047	3.262
Km-length of road/ km² within the respondents' residential location				
Population density/km² within	-0.500	-2.323		

Variables	Multitasking in Travel		Daily subjective well-being	
	Coeff	T-stat	Coeff	T-stat
the respondents' residential location Density of settlement area/ km² within the respondents' residential location			-0.987	-2.161
Density of trade centre area/ km² within the respondents' residential location	-2.901	-3.215		
Density of industrial area/ km² within the respondents' residential location	-71.521	19.284		
Density of plantation area/ km² within the respondents' residential location			-2.941	-4.693
Perceived number of public transport lines			-0.016	-4.095
Perceived travel time to CBD (minutes)	0.136	1.614		
Perceived travel time to government office areas (minutes)	2.094	31.614		
Perceived travel time to shopping centre (minutes)	1.332	0.379		
Perceived travel time to grocery store (minutes)	-0.762	-2.189		
Perceived travel time to park (minutes)				
Mean of the dependent variables	3.790		4.910	
SD	17.412		0.833	
Error term	21.222		5.982	
AIC	-95697.49		-37012.70	
BIC	-95050.68		-37365.89	
Log likelihood	-54300.75		-18458.35	

5.2 Daily subjective well-being

Table 3 shows the variables that are significance to individual's daily subjective wellbeing. This shows that these variables positively or negatively correlate with the individual's daily subjective wellbeing.

From the results, it shows that as expected the endogenous of percentage time of engaging multitasking in travel shows positive correlation on improving individuals' daily well-being. It also shows that when endogenity problem has not been tackled, only few multitasking variables shows a significance result in improving individuals' daily well-being.

Moreover, longer time spent for obligation activities such as in-home maintenance and working/studying at school tend to decrease individuals' well-being, whereas undertaking out-of-home discretionary activities such as grocery shopping and sport activites tend to improve individuals' subjective well-being.

The ones who take more trips and trip chains tend to have different result on deteriorating or improving

individuals' daily well-being. Undertaking more trips within a separate trip chain tend to improve individuals' daily well-being whereas taking more trips within a trip chain tends to show opposite result. It is presumably because the second and next trip chain tend to be utilized to perform more meaningful stops such as undertaking out-of-home discretionary activities [22].

Residing in an area that farther from city centre tends to reduce individuals' daily well-being. Residing within an area with a dense plantation and settlement areas tends to be located farther from city centre [8,23,24,21]. Therefore, residing in those areas negatively correlate with improving daily well-being of individuals.

6 Conclusion

Using hierarchical liniear regression and multi-dimensional three-week household time-use and activity diary, this study investigated the interaction among spatiotemporal variables on percentage time of engaging multitasking in travel, and how endogenous of percentage time of engaging multitasking in travel interact with other spatiotemporal variables on individuals' daily subjective well-being. The study excluded the day-to-day variability of activity and participation available in the dataset. However, the variability can be represented by average time amount for undertaking a particular activities.

Different from descriptive analysis result, the result in using hierarchical linear regression shows that having tighter time-space constraints tend to positively correlate with performing multitasking activities within travel more often. Moreover, the ones who peform more trips such as the youngest travellers and someone from middle income tend to perform multitasking activities in travel more often. When travellers' residence farther from their some basic amenities such as CBD, shopping centre and government offices, travellers tend to undertake multitasking within travel more often.

Endogenous of percentage time of engaging multitasking in travel shows positive correlation on improving someone's daily well-being, as expected. Applying hierarchical liniear regression tend to solve endogeneity problems that may appear between multitasking in travel variable and other spatiotemporal variables. Having commitment to perform longer obligation activity time such as working/studying at school time and in-home maintenance time tends to deteriorating individuals' daily well-being. However, any commitments to undertake out-of-home discretionary activities tend to improve daily well-being. In Bandung or Indonesia context, different trip management tends to provide different result on daily well-being. People in Bandung tends to undertake out-of-home discretionary visit or more meaningful visit on the second or next trip chain, whereas in first trip chain tend to have less meaningful impact in regards of daily well-being.

In term of policy implication, travel is considered as the least enjoyable activities [25,26]. Therefore, undertaking passive leisure within travel can be suggested to improve someone's daily well-being. The opportunity to undertake passive leisure within travel can be an

[Type here]

advantage of using public transport. The opportunity of having passive leisure more often during travel can be framed to attract more people using public transport in order to improve someone's daily well-being rather than taking private motorised mode.

References

1. T. Hägerstrand, *What about people in regional sciences?* The regional sciences association 247:21 (1970)

2. H.J. Miller, *Place-based versus people-based geographic information science.* Geography Compass 1:503-535 (2007)

3. T. Neutens, T. Schwanen, F. Witlox, The prism of everyday life: Towards a new research agenda for time geography. *Transport Reviews,* 31(1), 25-47 (2011)

4. S. Kenyon, & G. Lyons, Introducing multitasking to the study of travel and ICT: Examining its extent and assessing its potential importance. *Transportation Research Part A: Policy and Practice,41* (2), 161-175. doi:10.1016/j.tra.2006.02.004 (2007)

5. N. Baron. *Adjusting the volume: In-place and mobile dimensions of discourse control through technology,* Proceedings of Mobile Communication and the Network Society, Rutgers University, USA (2005)

6. S. Kenyon, What do we mean by multitasking? Exploring the need for methodological clarification in time-use research. *International Journal of Time Use Research,* 7(1), 609-619 (2010)

7. G. Circella, P.L. Mokhtarian, L.K. Poff, A conceptual typology of multitasking behaviour and polichronicity preferences. *International Journal of Time Use Research,* 9(1), 59-107 (2012)

8. D.B.E. Dharmowijoyo, Y.O. Susilo, A. Karlstöm, Analysing the complexity of day-to-day an individual's activity-travel pattern using Multi-dimensional Sequence Alignment Method: A case study in Bandung Metropolitan Area. Indonesia. *Journal of Transport Geography,* 64, 1-12 (2017)

9. O. Sullivan, J. Gershuny, (2012) Domestic outsourcing and multitasking: How much do they really contribute? Sociology Working Papers, Department of Sociology, University of Oxford (2012)

10. D.B.E. Dharmowijoyo, Y.O. Susilo, A.K.M. Tarigan, T. B. Joewono, Multitasking activities and daily subjective well-being. Submitted to *Transportation Research Part A* (2018)

11. D. Ettema, M. Friman, T. Gärling, L. E. Olsson, & S. Fujii, How in-vehicle activities affect work commuters' satisfaction with public transport. Journal of Transport Geography, 24, 215-222 (2012)

12. S. Rasouli, & H. Timmermans, Judgments of travel experiences, activity envelopes, trip features and multi-tasking: A panel effects regression model specification. *Transportation Research Part A: Policy and Practice,63*, 67-75. doi:10.1016/j.tra.2014.02.012 (2014)

13. T. Schwanen, D. Wang, Well-being, context and everyday activities in space and time. *Annals of the Association of American Geographers,* 104(4), 833-851 (2014)

14. D.B.E. Dharmowijoyo, Y.O. Susilo, A. Karlstöm, Collecting a multidimensional three-weeks household time-use and activity diary in the Bandung Metropolitan Area. *Transportation Research Part A,* 80, 231-246 (2015)

15. I.G. Cullen, V. Godson, (1975) Urban networks: The structure of activity patterns. *Progress in Planning,* 4, 1-96

16. T. Schwanen, M.P. Kwan, F. Ren. How fixed is fixed? Gendered rigidity of space-time constraints and geographies of everyday activities. *Geoforum,* 39, 2109-2121 (2008)

17. M. Paccione, Urban environment quality and human wellbeing – a social geographical perspective. *Landscape and Urban Planning,* 65, 19-30 (2003)

18. Y.O. Susilo, R. Kitamura, An analysis of the day-to-day variability in individuals' action space: exploration of 6-week mobidrive travel diary data. *Transportation Research Record,* 1902, 124–133 (2005)

19. D.B.E. Dharmowijoyo, Y.O. Susilo, A. Karlstöm, A., Day-to-day inter- and intra-personal variability of individual's activity space in a developing country. *Environment and Planning B,* 41, 1063-1076 (2014)

20. D.B.E. Dharmowijoyo, Y.O. Susilo, A. Karlstöm, A., The day-to-day variability in travellers' activity-travel patterns in the Jakarta Metropolitan Area. *Transportation,* 43(4)**,** 601-621 (2016)

21. D.B.E. Dharmowijoyo, Y.O. Susilo, A. Karlstöm, On complexity and variability of individuals' discretionary activities. *Transportation,* 54, 177-204 (2018)

22. P.L. Mokhtarian, Travel as a desired end, not just a means. *Transportation Research Part A,* 39, 93–96 (2005)

23. S.D. Arifwidodo, Exploring the effect of compact development policy to urban quality of life in Bandung. *City, Culture and Society,* 3, 303-311 (2012)

24. A.K.M. Tarigan, S. Sagala, D.A.A. Samsura, D.F. Fisabilillah, H.A. Simarmata, M. Nababan, Bandung City, Indonesia. *Cities,* 50, 100-110 (2016)

25. D. Kahneman, A. B. Krueger, D. A. Schkade, N. Schwarz, A. Stone, A survey method for characterizing day life experience: The day reconstruction method. *Science,* 306(5702), 1776-1780 (2004)

26. M. Friman, The structure of affective reactions to critical incidents. *Journal of Economic Psychology,* 25, 331-353 (2004)

[Type here]