THESIS

INVESTIGATING THE ROLE OF ACTIVITY-TRAVEL PARTICIPATION AND DAILY TRAVEL SATISFACTION ON PHYSICAL AND MENTAL HEALTH IN BANDUNG METROPOLITAN AREA

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STATEMENT ON ORIGINALITY

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Bandung, June 2019

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ABSTRACT

Daily travel satisfaction that may intermediate relationship between activity-travel behaviour variables, and physical and mental health has previously been considered. However, previous studies were rarely to use daily travel satisfaction as an intermediate variable in examining the effect of daily activity in conjunction with travel participation on physical and mental health. Using hierarchical structural equation modeling, this present study expanded its focus on travel and health by investigating the role and its interconnected aspects of activity-travel participation and daily travel satisfaction on physical and mental health in Bandung. Result showed that daily travel satisfaction can be measured by socio-demographic, activity-travel participation, travel attributes, and geographical condition, as well as positively correlated towards better self-reported physical and mental health.

Keywords: Activity-travel participation, daily travel satisfaction, physical health, mental health

PREFACE

This thesis is made as a completion of the bachelor education in Civil Engineering Faculty of Parahyangan Catholic University. INVESTIGATING THE ROLE OF ACTIVITY-TRAVEL PARTICIPATION AND DAILY TRAVEL SATISFACTION ON PHYSICAL AND MENTAL HEALTH IN BANDUNG METROPOLITAN AREA is the end product of several months throughout inclement uncertainty. Either to agree or to disagree, or rather to agree to disagree. It is a pleasure to express my appreciation to those who have influenced in this thesis.

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Jeanly Syahputri

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LIST OF NOTATIONS AND ABBREVIATIONS

α = Intercept value of linear and non-linear mixed effect

β = Coefficient parameter

ε = Error term

u = Uncorrelated individual specific error term

X = Independent value

y = Dependent value

AIC = Akaike Information Criterion

ATP = Activity-travel Satisfaction

BIC = Bayesian Information Criterion

BMA = Bandung Metropolitan Area

BP = Bodily Pain

DT = Daily Travel

DTS = Daily Travel Satisfaction

EMGB = Extended-Method of Goal-Directed Behavior

GH = General Health

HR-QOL = Health-related Quality of Life

ILS = In-home Leisure

IMD = In-home Mandatory

IMT = In-home Maintenance

LME = Linear Mixed Effect

Loglik = Loglikelihood

MH = Mental Health

Min = Minutes

ML = Maximum likelihood

N = Number of respondents

OLS = Out-of-home Leisure

OMD = Out-of-home Maintenance

OMT = Out-of-home Mandatory

PF = Physical Functioning

PH = Physical Health

QOL	= Quality of Life
RE	= Limitation on role functioning due to emotional problem
RP	= Limitation on role functioning due to physical health
SEM	= Structural Equation Model
SF	= Social Functioning
SPSS	= IBM SPSS Statistics version 25.0.0.0
STP	= Space and Time Prism
SWB	= Subjective Well-being
VT	= Vitality
WHO	= World Health Organization

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CHAPTER 1
INTRODUCTION

1.1 Background

Conventional studies of travel behaviour define the concept of a 'trip' (a movement from one place to another by a given mode of travel for a specified purpose) as the common unit of measurement and analysis (Jones, 1989). However, how the way an individual decides a single trip or daily trip is shaped by how the way an individual plan and schedules the daily activities, with whom and with what object the person needs to meet, in where the activities are undertaken, and what regulation shape the activities and travels. It means that a travel decision is an effect of complex interdependencies among planned/scheduled and undertaken activities, interdependencies between activities and travels itself, the possible of activity locations around the individuals, and the shape of regulation. Recently, activity-based human approach is utilized to replace this simplistic approach to travel behaviour (Jones et al., 1983). Understanding how people define and decide their daily activity-travel participation can help to provide insight understanding and insight proposed policies to achieve a particular goal. Understanding people continuous path through space and time whereby how people performs activities and travels, with whom, what objects and in which location she/he meets, and what regulation influences their daily life, reveals what policy that can or cannot achieve a particular goal. Individuals' decision making process is complex as a result of complex interaction of people constraints, needs and possible resources through time and space (Hägerstrand, 1970; Schwanen and Wang, 2014; Dharmowijoyo et al., 2015).

There is a case when activity and travel participation can shape health performance of individuals. Transport and health can be interlinked directly and indirectly (Zhang, 2013). Health performance plays as another dimension of individuals' capability factors that cannot be captured by conventional spatiotemporal variables (Dharmowijoyo et al., 2015, 2018). That is why in examining trade-off mechanism among spatiotemporal variables such as socio-demographic variables, time-use and activity participation, trip parameters,

transport network and built environment conditions, health parameters have direct contributions on multiple activity and travel variables (Dharmowijoyo et al., 2015, 2017, 2018). However, in order to examine relationship between spatiotemporal or activity-travel participation variables on social and health condition of individuals, the relationship is not straightforward (Zhang, 2013; Dharmowijoyo et al., 2015; Wee and Ettema, 2016). Commuting mode choices are found to have a direct and indirect influence on physical health and to influence mental health respectively (Tajalli & Hajbabaie, 2016). In particular, active commuting (walking and cycling) is associated with lower probability of being obese and having hypertension, diabetes, and mental health disorders than less active traveler (Tajalli & Hajbabaie, 2016). The focus on satisfaction with travel and daily routines is relevant both from a viewpoint of the implications of policies for well-being, but also since travel that is experienced as more satisfactory is more likely to be sustained over a longer period (Ettema et al., 2011).

The literature above tries to explain briefly about the relationships between travel behavior and health which has proliferated in research interest for over a decade (Wee & Ettema, 2016). Nevertheless, the complex relationships between travel behavior and health are still poorly understood, and consequently much additional research that at least make the conceptual structure of variables is needed (Wee & Ettema, 2016). This study extends the earlier work in the study of the complexity and variability of individuals' activity-travel patterns in Indonesia consisted of a dataset taken in Bandung (Dharmowijoyo, 2016). It has been correspondingly suggested to figure out the influence of activity and travel participation in conjunction with built environment on social and mental health. The study will use a multidimensional data that has been collected in 2013 in Bandung Metropolitan Area. The use of daily travel satisfaction variable as an intermediate variable in relating activity and travel participation and health performance has not been explored yet before and this will be the objective of this study. Few studies have explored how our daily activity and travel shape momentary, and daily and overall accumulation satisfaction (Schwanen and Wang, 2014; Dharmowijoyo et al., 2019). Shaping our daily activity and travel participation contributes around 40% in variation of improving our life satisfaction,

thus improving our health performance in term of physical and mental (Lyubomirsky & King, 2005). Daily activity and travel is a result of investment of long term process such as paid employment, family and friends (Pred, 1983; Schwanen and Wang, 2014), in which will create a future intentions and will develop future long term process including future life satisfaction.

There is abundant literature in some of the areas in this study, for example, (Tajalli & Hajbabaie, 2016) for an overview of the literature in the area of commuting mode choice impacts on public health in New York City, or (Susilo & Liu, 2017) for an overview of the relationship of time use and activity participation on health in Bandung with different view on how time-use and activity-travel participation will shape individuals' health performance. Previous studies were rare to use daily travel satisfaction as an intermediate variable in examining the effect of daily activity in conjunction with travel participation on physical and mental health. This present study expanded its focus on travel and health by investigating the role and its interconnected aspects of activity-travel participation and daily travel satisfaction on physical and mental health in Bandung.

1.2 Problem Statement

Previous studies have revealed that activity-travel behaviour have indirect relationship on social and mental health (Zhang, 2013; Dharmowijoyo et al., 2015; Wee and Ettema, 2016). However, physical and mental health show direct contribution in shaping activity-travel behaviour (Dharmowijoyo et al., 2015; Dharmowijoyo, 2016). Few studies indicated daily travel satisfaction may intermediate relationship between activity-travel behaviour variables, and physical and mental health. Activity and travel are materialized actions of human life it may be a proxy of daily travel satisfaction. How the way individuals shape their daily activity and travel pattern may shape their momentary and daily accumulation well-being (Ettema et al., 2010; Schwanen and Wang, 2014: Dharmowijoyo et al., 2019). Furthermore, people daily and activity patterns shape long term evaluation of individuals such as daily travel satisfaction (Schwanen and Wang, 2014; Dharmowijoyo et al., 2019).

This study tries to examine the role of daily travel satisfaction variables in intermediating the relationship between activity-travel behaviour with physical and

mental health. From a policy point of view, intervening how the way individuals shape their daily activity-travel participation may shape time-use, transport and land use policy in which not only shape people daily travel satisfaction, but also health performance. Nevertheless, the information contained on this study may also provide better understanding that enable further studies to design a policy that not only improves transport network conditions, but also enhances travel users' physical and mental health.

1.3 Research Objective

The aims of this study are:

1. To examine the interactions between activity-travel participation on daily travel satisfaction,
2. To investigate the role of activity travel-participation and endogenous daily travel satisfaction on physical and mental health.

1.4 Scope and Limitation

The scope and limitations of this study are:

1. This dataset was collected by the survey that was conducted in 2013 and has been used in several previous studies (e.g. Dharmowijoyo et al., 2018; Susilo & Liu, 2017; Dharmowijoyo,2018). Within the period gaps, since the dataset has collected there were not found any new regulations that may significantly differ the collected dataset. Therefore, dataset was still adequate to this current study.
2. In this study, health comprises physical and mental health only. In order to quantify health characteristic, the data was developed by health-related quality of life (QOL) questions and its potential influencing factors. Health-related QOL was one of the most widely used generic measures for health-related surveys and has been adopted by more than 110 countries (Zhang, 2013). However, the health condition data contained in this study is likely to be reference-dependent due to its self-reported information, meaning that individuals with almost the same actual (true) health condition may judge their own health conditions very differently (Susilo & Liu, 2017).
3. The activity-travel participation data was collected based on a panel time-use and activity diary. Instead of travel diary, panel time-use and activity diary

captured richer information in terms of individual's travel behaviors, as well as their in-home and out-of-home activity participation (Dharmowijoyo et al., 2015). The diary survey was divided into 96 time-slices in one day with 15 minutes' intervals.

4. The daily travel satisfaction data were collected based on psychological variables related questions of both positive and negative anticipated emotions (Dharmowijoyo et al., 2018). Afterward, the anticipated emotions will be utilized according to the Extended-Method of Goal-Directed Behavior (EMGB) (Dharmowijoyo et al., 2018). Compared to other leading theoretical models of behavioral predictions and post-behavior evaluation, EMGB showed superiority due to its inclusion of behavior desires and, as a result, the distinction between intention and behavior desire (Richetin et al., 2008).

1.5 Method

There are varieties of resources that have been used on behalf of this research such as literature review from the journals, books, articles, as well as online researches. All of the sources are trusted and updated to assure that the information gained is valid to be explored. Moreover, this study involved observation in identifying the activity-travel participation, travel satisfaction as well as mental and physical health condition. This study is completed using the 2013 Bandung Metropolitan Area (BMA dataset). The methods for this study are briefly explained in step by step with a set of plans in the following flowchart as shown in Figure 1.1.

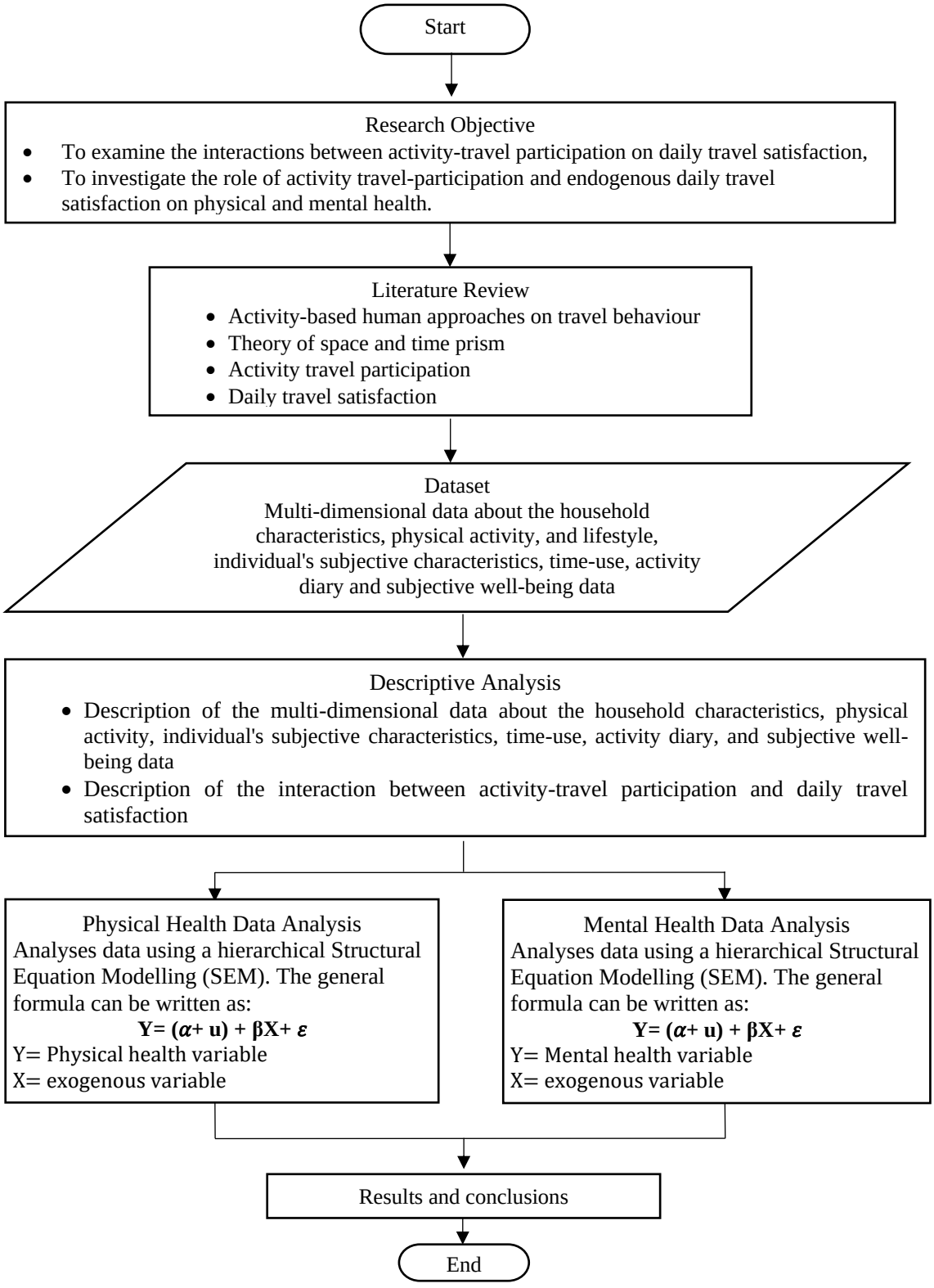

Figure 1.1 Research Flowchart