



Active commuting among junior high school students in a Chinese medium-sized city: Application of the theory of planned behavior

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ABSTRACT

In China, junior high school students are considered as adolescents, and their parents have guardianship of them. If junior high school students want to travel by motorized vehicles, they need to get assistance from their parents. The present study uses the theory of planned behavior to construct a model of dependent travel behavior that depicts the active commuting of junior high school students to school. A total of 449 junior high school students' parents in Jinjiang city of Fujian Province in China were surveyed by using a questionnaire. Non-parametric test, reliability and validity test, factor analysis, and a logistic model were performed to test the model. The results show that the model is a good fit for the junior high school students' active travel to school in the morning, and the Nagelkerke R^2 of the model is 0.68. Behavioral intention and perceived behavioral control of parents affect students' active commuting behavior, and behavioral intention is larger on behavior. Besides the inner attitude, the external environment such as non-motorized traffic facilities and the road traffic conditions along the way to school have significant effect on the behavior. In contrast to our expectations, parents leaving home for work in the morning, children's gender, grade, and household income have no significant influence on the behavior. Measures should be taken by the local government to promote students' active commuting to school, such as improving road traffic environment and providing safe routes.

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1. Introduction

Junior high school students, aged 12–15 years, show rapid physical development. They begin to possess the capacity of independent active travel. In China, however, active commuting by junior school students is less, and motorized travel occurs frequently, especially in some demonstration schools. Active commuting to school means that the student who is between 5 and 18 years either walks or rides a bike to school. Outside of China, many researchers focus on the active commuting choice, but there are few studies on Chinese students, especially on junior high school students.

According to the general principles of the civil law of China (The National People's Congress, 1987), junior high school students are adolescents and their parents have guardianship of them; thus, the attitude of the parents concerning safety

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problems may have a great influence on students' school commuting mode choice. According to the requirements for application and use of motor vehicle driver license in China (Ministry of Public Security of the People's Republic of China, 2012), adolescents cannot have a motor vehicle driver license; thus, when they want to drive a private car, they also need the help from their parents. As such, junior high school students are considered to be dependent travelers. Because of the dependency relationship between Chinese students and parents, the research not only needs to consider the objective factors affecting active commuting choice, but also needs to consider the parents' subjective attitude of active commuting choice.

As junior high school students' active travel needs to involve parents' subjective attitude, we need to verify the relationship between the above two by the attitude–behavior theory. The theory of planned behavior (TPB), which was improved by Ajzen based on the Theory of Reasoned Action, is a well-known theory explaining the relationship between beliefs and behaviors in the field of social psychology (Ajzen, 1991). Some scholars have studied mode choice behavior by using TPB and have obtained satisfactory forecast results (Abrahamse, Steg, Gifford, & Vlek, 2009; Eriksson & Forward, 2011; Hsiao & Yang, 2010; Thøgersen, 2006), while we study the active commuting mode choice of junior high school students by using TPB. Existing research reveals that the students' active travel behavior is affected by personal, family, social, and environmental factors (Timperio et al., 2006). We additionally consider external objective factors to construct an active commuting behavior model of the junior high school students.

Because the components of TPB study the inner processes of a person, the relationship between external factors and inner attitude requires a theoretical framework. We first explain dependent travel behavior and then introduce TPB about behavioral structure and the behavior-affecting variables. There are many studies on students' active travel behavior, and we summarize these studies to find the influencing factors. We then derive hypotheses about the expected relationship between active commuting behavior and the travel behavior variables.

Junior high school students' dependent travel behavior needs to consider parents' attitude toward students' active commuting choice. We conducted surveys on parents' perception of influencing factors on students' active commuting choice and the students' actual active commuting behavior. We then analyzed the formation of junior high school students' active commuting behavior. The purpose of this study is to determine the real and perceived barriers of the junior high school students' active commuting to school, which can provide the basis for corresponding traffic policy-making.

1.1. Dependent travel behavior

Students' active travel dependence on their parents differs as they grow older. When the students are young, they require their parents to accompany them on their active travel; thus, parental work patterns affect the probability of younger children walking or biking to school (McDonald, 2008a,b). When the children grow up and independently travel in a traffic environment, their parents most likely worry about the security of road facilities. Hume et al. (2009) reported that adolescents whose parents perceived insufficient traffic lights and pedestrian crossings in their neighborhood were less likely to increase their active commuting. Unfortunately, there are few studies on the dependent travel behaviors of junior high school students from the perspective of psychological behavior. Because the students' active travel is affected by the inner attitude of the parents and the external factors, the construction of the behavior based on the TPB will help to interpret the interactions and the influence variables.

1.2. The construction of the theory of planned behavior

The TPB components are a person's attitude, subjective norm, perceived behavioral control, intention, and behavior. On the basis of TPB, behavioral intention is the direct predictive variable to objective behavior; In turn, behavioral intention is assumed to be determined by attitude, subjective norm, and perceived behavioral control (Ajzen, 1991). On the basis of TPB, existing research focuses on travel mode choice, exceeding the speed limit, dangerous driving, traffic violence, etc. (Paris & Broucke, 2008; Tunnicliff et al., 2012; Zhou & Horrey, 2010). Among the studies on travel mode choice, few are concerned with the students' active commuting to school, and most were conducted on private cars for commuting, the usage of public transit, or the intention of take high speed trains (Abrahamse et al., 2009; Eriksson & Forward, 2011; Hsiao & Yang, 2010; Thøgersen, 2006).

In the composition of TPB, behavioral intention can directly predict behavior; in some cases, perceived behavioral control has a direct effect on behavior (Abrahamse et al., 2009; Paris & Broucke, 2008). Perceived behavioral control means the degree of difficulty that an individual perceives when they perform a specific behavior. It reflects the individual's perception of promoting or blocking behavioral factors. Abrahamse et al. (2009) reported car use for commuting by Canadian office workers and found that car use for commuting was mostly explained by variables related to individual outcomes such as perceived behavioral control. Furthermore, a study on drivers from Paris and the study by Paris & Broucke (2008) found that self-reported speeding was predicted by intention and perceived internal control.

There have been many studies on the objective factors of students' active travel; students' active commuting to school is affected by travel distance, socioeconomic characteristics, environment, and other factors. Distance is an important factor of active commuting to school. The longer the distance, the less is active travel (McDonald, 2007). Socioeconomic characteristics include students' personal characteristics and family characteristics. Personal characteristics include age, gender, degree of independence, etc. Children using active transport to commute were older (Yeung, Wearing, & Hills, 2008) and more independent (Merom, Tudor-Locke, Bauman, & Rissel, 2006). With regard to gender, the proportion of boys biking to school is

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