



Commute happiness in Xi'an, China: Effects of commute mode, duration, and frequency



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ABSTRACT

Commuting between home and work is an important aspect of everyday life. Based upon the broaden and build theory of positive emotions, experiencing happiness during commutes generates positive emotions that are beneficial for both individual and societal well-being. The existing literature on commute happiness is dominated by studies from the U.S., Canada, and Europe. Little is known about commute happiness in Chinese cities where electric bikes and employer-provided shuttle buses are common commute modes. This study uses original survey data collected from Xi'an, China to examine how commute happiness may differ across eight commute modes (walk, private bike, public bike, bus, subway, electric bike, shuttle bus, and private car) and by commute duration and frequency, while controlling for personal demographics and overall health and well-being. Results show that commute mode and duration are significantly associated with commute happiness while commute frequency is not. People who use employer shuttle buses reported the highest commute happiness, followed by people who use private bikes and then people who walk. People who use regular city buses reported the lowest commute happiness. People who use subway, public bikes, and electric bikes show no differences in commute happiness from car users. Longer commute duration is associated with lower happiness. Recommendations for Chinese cities to promote commute happiness include improving public bus services, investing in pedestrian and bicycle infrastructure, enhancing bike-transit integration, encouraging employer shuttle bus programs, and fostering jobs-housing balance. The results also indicate a gender gap in commute happiness that merits additional research.

1. Introduction

Happiness often defines a happy person as someone who experiences frequent positive emotions and infrequent negative emotions (Lyubomirsky et al., 2005). Traditionally, happiness has been considered as an emotional end-state resulted from a successful life. Recent research has paid greater attention to the benefits of experiencing happiness. New developments in the field of positive psychology have shown that happier people are often more successful across multiple life domains, including health and longevity (Danner et al., 2001; Deeg and Van Zonneveld, 1989; Diener and Chan, 2011; Lawrence et al., 2015), income and productivity, and social relationships such as marriage and friendship (Diener and Biswas-Diener, 2002; Lyubomirsky et al., 2005). The broaden-and-build theory of positive emotions has suggested that positive emotions—the experience of happiness—can broaden one's awareness and encourage novel and exploratory thoughts and actions. Over time, this broadened behavioral repertoire builds skills and

resources that are not only beneficial to the individual, but also to families, work groups, and the society as a whole (Cohn et al., 2009; Fredrickson, 2001; O'Brien, 2005).

Despite the extensive literature on happiness in general, it is only recently that researchers have begun to explore happiness during commutes. Commuting between home and work plays an important role in people's everyday life. Many residents, especially those who live in large cities, spend a significant amount of time every day on work-related trips. According to a 2014 survey of the 50 largest cities in China, the City of Xi'an—our study city—ranked 17th in average commute distance and duration (Baidu, Inc., 2014). The average one-way commute distance and duration in Xi'an were 12.59 km (7.82 miles) and 38 min. Looking at specific modes, average one-way commute distance and duration were 12.8 km and 43 min by public transportation, and 13.1 km and 30 min by car. According to the survey, the city with the longest commute distance and duration in China was Beijing. The average one-way commute distance and duration in Beijing

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were 19.2 km and 52 min (Baidu, Inc., 2014).

Given the long commutes observed in large Chinese cities, it is increasingly important to understand the connection between commute characteristics (mode, duration, and frequency) and commute happiness in the unique context of Chinese cities. In reviewing studies on commute happiness, we find that studies on commute satisfaction are relevant because commute satisfaction and happiness are both indicators of subjective well-being during commutes (referred hereafter as commute well-being). Existing studies on commute well-being are mostly from the U.S., Canada, and Europe (Abou-Zeid and Ben-Akiva, 2011; Abou-Zeid et al., 2012; Cantwell et al., 2009; Eriksson et al., 2013; Ettema et al., 2012; Lucas and Heady, 2002; Manaugh and El-Geneidy, 2013; Olsson et al., 2013; Ory et al., 2004; Páez and Whalen, 2010; St-Louis et al., 2014). To the authors' knowledge, only four empirical studies on commute well-being are from China (Mao et al., 2016; Meng et al., 2013; Ye and Titheridge, 2017; Zhao et al., 2014). Of the four studies, only Mao et al. (2016) and Ye and Titheridge (2017) specifically examined how commute characteristics such as commute mode were associated with commute well-being.

Empirical evidence in the existing literature on commute well-being outside China may not be transferable to Chinese cities because the commute contexts in Chinese cities are quite different from those of U.S., Canadian, and European cities. First, a significant number of employers in Chinese cities allow an extended midday break for lunch and after-lunch rest. Commute frequency is an important measure of commute behavior in China because workers may commute twice a day to have their midday rest at home. Second, transportation modes in China are more diverse than in developed countries, including unique modes such as employer shuttle buses and electric bikes. Third, although China has experienced a rapid increase in auto ownership and use, alternative transportation modes including transit, biking, and walking remain prominent in many cities. The public transportation mode share of all trips conducted in Xi'an was 46% in 2017 (Xi'an Transit Agency 2017). Additionally, public bikes have become an important commute mode in Chinese cities. Despite being a late adopter of bicycle sharing (the first information technology-based bicycle sharing program in mainland China was launched on May 1, 2008 in the city of Hangzhou), China has become the country with the largest number of programs and the largest public bicycle fleet (Earth Policy Institute, 2015). In 2015, 274 Chinese cities had public bicycle programs and the estimated size of the public bicycle fleet was 0.86 million. In comparison, France had the second largest public bicycle fleet in the world at 43 thousand (Earth Policy Institute, 2015). Given these unique contexts, it is important to conduct empirical studies of commute happiness and examine how commute happiness differs across various modes and by commute duration and frequency in Chinese cities.

This paper uses original survey data collected from twelve locations in Xi'an, China to examine how commute happiness may differ across eight commute modes (walk, private bike, public bike, bus, subway, electric bike, shuttle bus, and private car) and by commute duration and frequency. Xi'an is the political, economic, educational, cultural, and information center of the Shaanxi Province; the most populous city in Northwestern China; and one of the major cities in China that have comprehensive transportation systems. The analysis in this paper controls for personal demographics (gender, age, income, and household size), overall well-being levels (being optimistic and happy in general), and health status.

2. Prior research

Although academic researchers tend to define happiness narrowly as the emotional aspect of subjective well-being, in practice happiness is often used more broadly to include both the emotional and cognitive aspects of subjective well-being. The emotional and cognitive aspects are respectively about how we "feel" and "think" our lives in general or specific life domains such as work, family, finance, leisure, commute,

etc. (Diener, 1984; Kahneman and Deaton, 2010). In this paper, our measure of commute happiness is specifically about how people "feel" about their commutes between home and work, which is different from the widely used Satisfaction with Travel Scale (STS) measure developed by Ettema et al. (2011) and later tested by De Vos et al. (2015). Ettema et al.'s (2011) STS measure includes both cognitive and affective evaluation items. Bergstad et al. (2011) developed an alternative version of STS that adapted the Satisfaction with Life Scale measure developed by Diener et al. (1985). Bergstad et al.'s (2011) STS measure includes cognitive evaluation items only.

This literature review focuses on empirical studies linking commute characteristics to commute well-being. Studies reviewed here include 1) studies measuring the emotional aspect of commute well-being (often in the form of commute happiness ratings), 2) studies measuring the cognitive aspect of commute well-being (often in the form of commute satisfaction ratings), and 3) studies measuring both aspects, e.g., the STS ratings developed by Ettema et al. (2011). Conceptual studies on commute well-being such as Lyons and Chatterjee (2008) are excluded from this review. In addition, empirical studies and literature review papers on travel behavior and subjective well-being in general (not specifically subjective well-being during commutes) such as Beige and Axhausen (2017), Choi et al. (2013), Chng et al. (2016), De Vos et al. (2013), Ettema et al. (2010), Ettema et al. (2016), and Nie and Sousa-Poza (2016) are excluded.

Common commute characteristics examined in the literature on commute well-being include commute mode (typically walk, bike, bus, rail, and car), cost, duration, distance, direction (from home or to home), and activities carried out during the commute (Abou-Zeid and Ben-Akiva, 2011; Abou-Zeid et al., 2012; Cantwell et al., 2009; Eriksson et al., 2013; Ettema et al., 2012; Lancée et al., 2017; Manaugh and El-Geneidy, 2013; Mao et al., 2016; Meng et al., 2013; Mokhtarian et al., 2015; Morris and Guerra, 2015b; Olsson et al., 2013; Páez and Whalen, 2010; Smith, 2017; St-Louis et al., 2014; Stone and Schneider, 2016; Turcotte, 2006; Ye and Titheridge, 2017; Zhao et al., 2014). A limited number of studies examined how crowding and seasonality (warm vs. cold seasons) may affect commute well-being (Cantwell et al., 2009; Eriksson et al., 2013; Mokhtarian et al., 2015; Smith, 2017). Hassenzahl et al. (2017) examined the effects of interactive systems available in cars on car driving experiences. Most studies examining the connections controlled for personal demographics including age, gender, income, and household size. Fewer studies controlled for attitude- and personality-related factors such as motivations (Manaugh and El-Geneidy, 2013), travel preferences (De Vos and Witlox, 2016; De Vos et al., 2016; Lai and Chen, 2011; St-Louis et al., 2014; Ye and Titheridge, 2017), overall life satisfaction (De Vos, 2018), and feeling secure (Eriksson et al., 2013). Lucas and Heady (2002) controlled for the effect of a flextime-working environment; and Olsson et al. (2013) controlled for the effect of being employed in a recession.

Data for empirical studies on commute well-being typically come from self-administered surveys. The most frequently used survey method is the web-based survey (Abou-Zeid and Ben-Akiva, 2011; Abou-Zeid et al., 2012; Cantwell et al., 2009; Lucas and Heady, 2002; Manaugh and El-Geneidy, 2013; Páez and Whalen, 2010; Smith, 2017; St-Louis et al., 2014), followed by mail survey (Ettema et al., 2012; Olsson et al., 2013; Ory et al., 2004), face to face survey (Meng et al., 2013; Ory and Mokhtarian, 2005; Zhao et al., 2014), and in-class paper survey (Eriksson et al., 2013). Most of the surveys targeted people who are employed (commuters). Several studies targeted university students and university employees (Eriksson et al., 2013; Manaugh and El-Geneidy 2013; Páez and Whalen, 2010; St-Louis et al., 2014). Most studies used data from U.S., Canadian, and European cities. To the authors' knowledge, there are only four empirical studies that used data from Chinese cities (Mao et al., 2016; Meng et al., 2013; Ye and Titheridge, 2017; Zhao et al., 2014). Meng et al. (2013) found that inner city residents have greater commute satisfaction than suburban residents in Beijing, China. Zhao et al. (2014) found that spatial

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