



Influence of childhood and adulthood attitudinal perceptions on bicycle usage in the Bangalore city



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ABSTRACT

Bicycle commuting holds the potential to be an effective solution in combating anthropogenic pollution, urban congestion and increasing health concerns. In a developing country context, few studies have attempted to analyse the influence of various factors that contribute to a low ridership of bicycle. Using data collected through a questionnaire survey in the Indian city of Bangalore, the present study investigates the extent to which variables capturing the attitudinal and social norms, in childhood, affect an individual's decision to continue or discontinue bicycle on transition to adulthood. Further, the study elicits the influence of various adulthood perceptions that limit the usage of bicycles and that can motivate the future usage of bicycles. The study also examines the substitutive effect between bicycles, and the sustainable modes of walking and public transit. The results suggest that a negative social image attached with cycling in childhood contribute to an individual's decision to continue or discontinue cycling after childhood. Further, the results show that part-time cyclists are more sensitive to structural barriers (infrastructure, build environment) while non-cyclists weigh more heavily on personal barriers (attitudes and social norms). Portrayal of cycling in positive light through promotional programs also has a strong positive impact on the choice to bicycle. The study findings shed light on policies and strategies that can help improve the attractiveness of bicycling and augment bicycle use in Indian cities.

1. Introduction

Non-motorized transport (NMT) modes like bicycle and walking have been widely recognized as key components of sustainable mobility because of their potential for mitigating urban congestion, pollution, accidents, and deteriorating health due to sedentary lifestyles (Riplogle, 1992; Bergström and Magnussen, 2003; Stinson and Bhat, 2004; Ryley, 2006; Gatersleben and Appleton, 2007; Gatersleben and Uzzell, 2007; Rastogi, 2009). Bicycling, through efficient use of restricted roadway capacity can help reduce peak-period congestion and can serve as a travel mode for destinations not served by public transit (Handy and Xing, 2011; Murphy and Knoblauch, 2004). Bicycling offers an affordable transport option for low and middle income groups in developing countries like India because of its low initial capital investment and negligible maintenance costs (Guitink et al., 1994; Servaas, 2000; Tiwari, 2001; Joewono and Kubota, 2005; Buis 2009).

Historically, built environment factors like infrastructure, urban form

and facilities at work; travel distance and natural environmental factors like gradient, weather, landscape and rainfall have been studied extensively in the context of bicycle travel behaviour (Taylor and Mahmassani, 1996; Wardman et al., 1997; Rodríguez and Joo, 2004; Stinson and Bhat, 2005; Hunt and Abraham, 2007; Zhang et al., 2014a, b; Moritz, 1998; Pikora et al., 2003; Pucher and Buehler, 2006; Pucher and Buehler, 2008). The bicycle travel behaviour has also been found having strong links to personal and household characteristics though their effect varied from country to country (Brandenburg et al., 2004; Rietveld and Daniel, 2004; Stinson and Bhat, 2005; Parkin et al., 2008). In countries with low cycling rates, men tend to cycle more compared with women, but in countries with high cycling rates like Netherlands, cycling has a more equitable distribution among the two genders (Garrard et al., 2008). The relationship between income and cycling is somewhat ambiguous; Pucher et al. (1999), Pucher and Buehler (2006) and Pucher and Buehler (2010) found high income having a negative impact on cycling but Dill and Carr (2003) and Zacharias (2005) found no such effect.

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However, the modal share of bicycle in Indian cities has been dwindling over the years because of the rising income, the rising car-ownership levels, and the indifferent attitudes of the people. Though the *National Urban Transport Policy (2006)* duly recognizes the safety and mobility concerns of non-motorized commuters, little efforts have been made in the area of cycle-inclusive planning. Most studies cite the hostile road conditions, unfavourable climate, difficulty in non-work trip usage, long trip distances, lack of infrastructure and limited awareness of the benefits, as primary impediments for usage of bicycles. The effect of these impediments on the selection of bicycle as a travel mode varies with an individual's prior experience with bicycling (Gatersleben and Appleton, 2007). Previous literature has shown that these barriers are a manifestation of factors, both within and outside an individual's control. These include policy sensitive factors (physical environment) and factors reflecting internal and social considerations (quality of previous experience, attitude and perception of social norms). Factors reflecting internal and social considerations like an individual's perception of bicycling during childhood could be associated with the current bicycle usage. For example, social acceptance during childhood can be assumed to influence the current travel behaviour. The social acceptability observed in childhood may create a certain image of bicycling in an individual's mind. A positive image may induce a natural predisposition towards bicycling, which subsequently may increase his/her chances of using bicycling on becoming adult. Hence, analysing the impact of these factors - quality of previous experience, attitude and perception of social norms - would aid in developing a more effective transportation planning framework that is inclusive of bicycling. The present work is an endeavour in this direction. The objectives of the present work are set as following.

- To understand the effect of various attitudinal, social and infrastructure-related factors on a person's decision to continue or discontinue bicycling after childhood.
- To elicit the effect of different attitudinal, social and infrastructure-related factors in adulthood that limit the usage of cycles and that can motivate the usage of bicycles in future among part-time cyclists and non-cyclists.
- To formulate specific policies that can aid in the promotion of bicycling for urban commute.

The remainder of the paper is organized as follows. A literature review is presented in the next section, followed by a description of the methodology. After that the results are presented. The study then concludes by providing a discussion on the results and by presenting some major conclusions including specific policy implications.

2. Literature review

The psychological attitudinal theories have found way in analysing bicycle travel behaviour only recently; the prominent one being the 'Theory of Planned Behaviour' proposed by Ajzen (1991). According to the theory, attitudes (defined as the degree to which performance of the behaviour is positively or negatively valued), subjective norm and perceived behavioural control are factors that are linked with a person's intention to espouse a future behaviour. The studies by Bamberg et al. (2003), de Bruijn et al. (2005) and Heinen et al. (2010a) eliciting the psychological effects of an individual on bicycling behavior drew heavily from the 'Theory of Planned Behaviour' proposed by Ajzen (1991). Further, Gatersleben and Appleton (2007), Gatersleben and Uzzell (2007), Weden et al. (2008) and Heinen et al. (2010b) have shown the prominent role played by attitude, norms, habits, preferences and prior experience, while choosing a bicycle mode. Heinen et al. (2010a) reported that the attitudinal factors including awareness, trip-based benefits and safety during travel had significant impacts on the choice to commute by bicycle.

Various factors shape the decision to continue or discontinue

bicycle-use as an individual matures. Chatterjee et al. (2013a,b) explained a cycling trajectory that encompassed a person's thoughts, feelings, capabilities and actions related to cycling. This trajectory evolved over a person's life depending on various life-events and mediating factors. For example, people would be subjected to various life-events like a change in the employment, a new job, residential relocation etc., and these events combined with mediating factors, like whether they had used a bicycle in the childhood, may affect their cycling trajectory (Chatterjee et al., 2013). Among women, mediating factors like health and family status were observed influencing the bicycling pattern along their life course (Bonham and Wilson, 2012^a). Further, presence of an immediate relative who cycled activated cycling among women (Bonham and Wilson, 2012^b). Social influence from an immediate household member had a major impact on the bicycling behaviour of people (Sherwin et al.; 2014). These literatures indicate the existence of a strong influence of social norms and attitude on the bicycling habit of individuals along their life-span. Intervention at an earlier stage, at the childhood stage itself, may develop a positive mindset among people towards bicycling.

Attitudes and perceptions are formed along the way an individual matures. An analysis of the influence of various factors in childhood as an adult may throw light on methods that ensure a positive childhood perception towards bicycling. This may help retain bicycle usage as adults. There is an absence of research that trace the impact of childhood factors related to attitude, perceived social norms and change in preferences, in the decisions to continue or discontinue use of bicycle, as the individual makes a transition to adulthood (Unwin, 1995). However, the study of Underwood et al. (2014), using a retrospective analysis, determined an influence for attitudinal factors during high school on adulthood bicycling.

In an Indian context and more generally in a global context, the studies on bicycle travel behaviour, especially the ones available on the mode choice patterns of teenagers and bicycle-use during childhood, are limited to studying the effect of socio-demographic factors, physical infrastructure, social environment and parental habits (Gwilliam, 2003; Rastogi, 2009; Rastogi and Rao, 2009; Jain et al., 2010; Verma et al., 2015; Ewing et al., 2004; Mitra and Buliung, 2012; Wati et al., 2012; Kamargianni and Polydoropoulou, 2013). These studies focus separately on the bicycle-use among children and adults, and do not consider the variations in cycle usage as an individual makes transition to adulthood. In an Indian context, there is also a lack of literature that explores the role of attitudes on choice of bicycle as a commute mode (Verma et al., 2016).

Another aspect that was observed as a part of literature review was the absence of studies in an Indian context considering the categorization of bicyclists (commuter cyclists - full time users of bicycle for non-discretionary trips, part-time cyclists - occasional users of bicycle and non-cyclists), and the impact of dedicated awareness and promotional programs. Nkurunziza et al. (2012) illustrated the need for segmentation of bicyclists on the basis of travel behaviour variation to ensure a deeper penetration of policies in a developing country with limited bicycle usage.

3. Methodology

Fig. 1 shows the methodological framework used for the present study. The explanatory variables in the present study cover attitudinal, subjective norms and environmental (social, built, natural) aspects that are measured on a five point Likert scale. In the first part, the study evaluates the impact of various attitudinal factors and social norms that influence the decision of an individual to continue or discontinue bicycling after childhood, using a binary logistic regression model. Logistic regression models have categorical outcome variables and have extensive application in bicycle travel behaviour studies (Parkin, Wardman and Page, 2008; Handy and Xing, 2011; Ma and Dill, 2015). The independent variables used in this model represent the

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