Journal of Environmental Psychology 41 (2015) 155–165

Contents lists available at ScienceDirect

Journal of Environmental Psychology

journal homepage: www.elsevier.com/locate/jep

Social clustering in high school transport choices

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ARTICLE INFO

Article history:
Available online 9 January 2015

Keywords:
Transport
Active transport
Adolescents
Social networks
Friendship
Sustainability

ABSTRACT

Active transport offers opportunities to reduce the environmental impacts of car travel and improve health. During adolescence, friends and parents may influence transport mode to school. Using a social network survey of 934 high school students we investigated whether students' walking, cycling, bus and car travel to school were predicted by their friends' transport behaviour, accounting for parent encouragement, ride availability, distance to school, gender, school unit and age. In addition, we examined whether descriptive norms, friend encouragement or co-travel requests mediated the effect of friends' active transport behaviour. We found that friends' transport behaviour predicted ego behaviour, particularly for cycling. Descriptive norms and co-travel requests, but not friend encouragement, approached significance as mediators of friends' active transport similarities. Parent encouragement for active transport was a particularly strong predictor of transport mode. Implications for future research and interventions are discussed.

1. Introduction

1.1. Rationale

Transport generates a substantial portion of greenhouse gas emissions, comprising nearly 23% of the world's energy related emissions (International Energy Agency, 2009). Private car use produces substantially more greenhouse gases per passenger kilometre than public transport in most countries, whilst walking and cycling are virtually emission free (IPCC, 2007). Replacing car journeys with alternative forms of transport also reduces traffic congestion and improves the overall safety of pedestrians, passengers and other road users. Active transport such as walking or cycling also provides an opportunity to increase regular physical activity (Wanner, Götschi, Martin-Diener, Kahlmeier, & Martin, 2012) which can in turn contribute to physical and psychological health (Garrard, Rissel, & Bauman, 2012). Local car trips that could be walked or cycled are an important and feasible target for change (Maibach, Steg, & Anable, 2009).

Adolescence may be a particularly important time for shaping adult transport patterns (e.g. Line, Chatterjee, & Lyons, 2012; Simons et al., 2013) and adult health outcomes (Lawlor & Chaturvedi, 2006). Peers are salient during adolescence and have been found to be influential for a range of behaviours (Brechwald & Prinstein, 2011; Brown, Bakken, Ameringer, & Mahon, 2008). Social interventions, including those involving peers, may increase participation in active transport (Orsini, 2006; Panter, Jones, van Sluijs, & Griffin, 2010) but little is known about the role of peers in adolescents' transport choices to and from school.

1.2. Clustering of behaviour within social networks

Social networks describe relationships between individuals in a given setting or community. Social network methods generally represent individuals as nodes in a network and social relations (e.g. friendships, interactions, associations) as the links between nodes. Social clustering (also known as network autocorrelation) describes a situation in which linked individuals in a network are more similar on a given attribute than would be expected due to chance. To establish similarities in friends' attributes, each individual's behaviour is measured independently and mapped onto the network. People often assume others' behaviour is more similar to their own than it actually is (McPherson, Smith-Lovin, & Cook, 2001; Prinstein & Wang, 2005). Therefore using independent reports collated on a social network avoids a similarity bias or "false consensus effect" that can arise if individuals are asked to estimate the behaviour of their friends.

Social clustering can arise from a combination of processes that can be broadly categorized as *social contagion*, *homophily* or

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http://dx.doi.org/10.1016/j.jenvp.2015.01.001
0272-4944/

secondary homophily. Social contagion captures processes whereby an individuals' behaviour is influenced by the behaviour of their peers. In contemporary work, the term social contagion is used synonymously with *socialisation*, *friend influence* and *peer effects* (e.g. Brechwald & Prinstein, 2011; Christakis & Fowler, 2008; Dishion & Tipsord, 2011; Eisenberg, Golberstein, Whitlock, & Downs, 2013; Shalizi & Thomas, 2011). The term has historically been used to describe a myriad of sub-types of influence, particularly subtypes of imitation (see Levy & Nail, 1993; Wheeler, 1966). In this paper we use social contagion as it is most commonly used in current literature, to describe processes in which friends influence the *ego* (focal individual) to behave in ways that are consistent with their own behaviour.

Homophily, refers to the predisposition to select people with similar traits as friends. Homophilic selection of friends may be based on the behaviour of interest (manifest homophily), which in our case would be transport choices (Shalizi & Thomas, 2011). Friendship selection may also relate to a trait that is associated with the behaviour of interest (secondary homophily when the trait is measured, latent homophily if the trait is unmeasured) (Shalizi & Thomas, 2011). For transport behaviour, secondary or latent homophily could include selecting friends on the basis of gender or distance from school, or other traits likely to influence transport choices. For example, adolescents are more likely to select friends who live close by (Preciado, Snijders, Burk, Stattin, & Kerr, 2012) and who are the same age and gender (McPherson et al., 2001), which are all factors that have been linked to transport choices (Sirard & Slater, 2008). Features of the home environment such as parent encouragement and ride availability may also play a role here. For example, parent encouragement is known to correlate with transport choices (Panter, Jones, & van Sluijs, 2008) and may give rise to secondary homophily if students tend to form friendships with those whose parents have similar attitudes toward particular transport choices.

It can be difficult, if not impossible to conclusively differentiate between these three classes of explanation in social network surveys. Social contagion, homophily and secondary homophily are not mutually-exclusive processes (Brechwald & Prinstein, 2011; de la Haye, Robins, Mohr, & Wilson, 2011) and if homophily exists on the variable of interest this can contaminate estimation of social contagion unless very strong assumptions are made (Shalizi & Thomas, 2011). Nevertheless, simple tests for clustering of behaviour on a network can identify whether at least one of the three processes is likely to be present. Further, including potential secondary homophily variables in the analysis makes it possible to quantify their relative importance and may allow contagion effects to be ruled out. That is, if there is no clustering in transport behaviour after controlling for secondary homophily variables, this makes a contagion explanation unlikely. Conversely, incorporating variables linked to possible social contagion mechanisms into the analysis makes it possible to test the plausibility of these causal pathways and potentially provides indirect support for the role of contagion.

1.3. Mechanisms of contagion within social networks

When behaviours cluster, and we suspect there is some degree of social contagion present, we can ask what interpersonal mechanisms are likely driving this. Empirical work on the mechanisms underlying social contagion has been a gap in the literature on social contagion although more attention has been paid to these mechanisms in recent years (Brechwald & Prinstein, 2011).

One potential factor driving contagion effects is individuals' perception that a behaviour is common among their friends. According to normative focus theory (Cialdini, Reno, & Kallgren, 1990) information about common behaviour (descriptive norms) may provide a short-cut to decision making, leading people to adopt the common behaviour in a particular context (Cialdini et al., 1990). People may also consciously adopt the common behaviour because they assume that these behaviours are likely to be rewarded by their friendship group (Brown et al., 2008) or, drawing on social categorisation theory, because the common behaviour may become part of their identity as group members (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). If people are consciously adopting the common behaviour then descriptive norms around what behaviours are most common should mediate similarities between the individual's travel mode choice and that of their friends. A Dutch study found that adult car use was related to perceptions of how often important others travel by car (Steg, 2005) and descriptive norms appear to be consistently related to physical activity (Maturo & Cunningham, 2013). No research to our knowledge has assessed whether descriptive norms predict adolescent transport behaviour, nor whether they underpin contagion processes if these are present.

A second mechanism potentially driving contagion effects involves reward and encouragement from peers. People may promote behaviours that match their own through verbal influence, requests and teasing (Brown et al., 2008) because conformity to ingroup relevant norms increases positive emotions for the perceiver (Christensen, Rothgerber, Wood, & Matz, 2004) and affirms the influencers' own behaviour. The term “encouragement” is often used to capture verbal influence, particularly within the health promotion literature.

Encouragement has consistently been found to predict physical activity in adolescence (Maturo & Cunningham, 2013) and friend encouragement of physical activity is also related to adolescent active transport (Deforche, Van Dyck, Verloigne, & De Bourdeaudhuij, 2010; Hohepa, Scragg, Schofield, Kolt, & Schaat, 2007). One study of UK children found that friend encouragement for active transport related to whether students cycled to school, but only for students living close to school (Panter et al., 2010). No research to our knowledge has explored whether friend encouragement of active transport is related to transport choices for adolescents. If encouragement is important for active transport and people tend to encourage this behaviour when they do it themselves then encouragement may generate similarities in friends' behaviour.

Social contagion may also arise from opportunities to travel with friends. Transport with friends is likely to be more enjoyable than travelling alone or with parents and the time spent travelling together may also contribute to a sense of belonging, which Baumeister and Leary (1995) propose is a fundamental human motivation. Pre-adolescents in Scotland and New Zealand have reported that travelling to school can be a fun opportunity to socialise with friends and suggested that travelling with friends might boost active transport participation (Orsini, 2006; Panter et al., 2010). Older adolescents also appear interested in co-travel: Belgian youth reported that opportunities to travel with friends altered their choice of transport mode or the distance they were willing to cycle for leisure journeys (Simons et al., 2013).

1.4. The present study

This study investigates similarities in friends' transport behaviour in a New Zealand high school social network. In particular it examines students' walking, cycling, car travel and bus travel choices at a single time point. First, we aim to identify whether adolescent transport behaviour to school shows social clustering. Second, we aim to test whether and to what extent this clustering holds when controlling for a range of demographic and context