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The effects of transport mode use on self-perceived health, mental health, and social contact measures: A cross-sectional and longitudinal study

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ABSTRACT

Background: Transport mode choice has been associated with different health risks and benefits depending on which transport mode is used. We aimed to evaluate the association between different transport modes use and several health and social contact measures.

Methods: We based our analyses on the Physical Activity through Sustainable Transport Approaches (PASTA) longitudinal study, conducted over a period of two years in seven European cities. 8802 participants finished the baseline questionnaire, and 3567 answered the final questionnaire. Participants were 18 years of age or older (16 years of age or older in Zurich) and lived, worked and/or studied in one of the case-study cities. Associations between transport mode use and health/social contact measures were estimated using mixed-effects logistic regression models, linear regression models, and logistic regression models according to the data available. All the associations were assessed with single and multiple transport mode models. All models were adjusted for potential confounders.

Results: In multiple transport mode models, bicycle use was associated with good self-perceived health [OR (CI 95%) = 1.07 (1.05, 1.08)], all the mental health measures [perceived stress: coef (CI 95%) = −0.016 (−0.028, −0.004); mental health: coef (CI 95%) = 0.11 (0.05, 0.18); vitality: coef (CI 95%) = 0.14 (0.07, 0.22)], and with fewer feelings of loneliness [coef (CI 95%) = −0.03 (−0.05, −0.01)]. Walking was associated with good self-perceived health [OR (CI 95%) = 1.02 (1.00, 1.03)], higher vitality [coef (CI 95%) = 0.14 (0.05, 0.23)], and more frequent contact with friends/family [OR (CI 95%) = 1.03 (1.00, 1.05)]. Car use was associated with fewer feelings of loneliness [coef (CI 95%) = −0.04 (−0.06, −0.02)]. The results for e-bike and public transport use were non-significant, and the results for motorbike use were inconclusive.

Conclusions: Similarity of findings across cities suggested that active transport, especially bicycle use, should be encouraged to improve population health and social outcomes.

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1. Introduction

To design cities able to produce health and well-being outcomes, it has being suggested that transport planning should assume a major role (Giles-Corti et al., 2016). Transport is associated with economic and social development, but also with different health risks and benefits depending on which transport mode is used (Nieuwenhuijsen et al., 2016). Car use in cities has been associated with negative effects, including congestion, use of physical space, noise, heat, emissions of greenhouse gases, air pollution exposure and lack of physical activity (Dons et al., 2013; Nieuwenhuijsen and Khreis, 2016). Driving time has been associated with high stress (Novaco and Gonzalez, 2009; Legrain et al., 2015; Mattisson et al., 2016), lower psychological well-being (Martin et al., 2014) and more recently also with cognitive decline (Bakrania et al., 2017). Motorbike use has been associated with particularly high risks for injuries, disability, and deaths due to traffic crashes (Rodrigues et al., 2014). Public transport use has often been associated with low travel satisfaction (Novaco and Gonzalez, 2009), but also with psychological well-being (Martin et al., 2014), and increased physical activity levels and reduced BMI (Rissel et al., 2012; Sener et al., 2016; Brown et al., 2015). Active transport – i.e. walking and bicycling – has been associated with multiple health benefits including lower all-cause mortality (Kelly et al., 2014; Celis-Morales et al., 2017), cardiovascular risk (Celis-Morales et al., 2017; Hamer and Chida, 2008; Xu et al., 2013; Oja et al., 2011), body weight (Xu et al., 2013; Wanner et al., 2012), diabetes risk (Saunders et al., 2013), risk of being stressed (Avila-Palencia et al., 2017), better physical and mental well-being (Martin et al., 2014; Humphreys et al., 2013), and health-related quality of life (de Geus et al., 2008). Active transport has also been shown to have other societal benefits such as helping reduce air pollution, greenhouse gas emissions, and noise, and improving social interaction (de Nazelle et al., 2011; Brand et al., 2013).

Until now studies have assessed associations between a single transport mode and health outcomes or made comparisons across transport modes when evaluating associations with health outcomes. We are not aware of any studies that have assessed how the use of multiple transport modes (multi-modality) is related to health, which may be a more realistic description of transport behaviour for many people nowadays. Further, few studies have evaluated associations between transport and social capital indicators showing its relevance (Besser et al., 2008; Mattisson et al., 2015), but none have evaluated associations between transport and loneliness, although loneliness is currently considered to be a major problem in Western society (de Gierveld et al., 2016). Moreover, most studies in transport and health are cross-sectional and conducted in one country. Consequently, international and longitudinal studies are needed to represent variability in transport behaviour.

The main aim of this study was to evaluate the association between different transport modes use and several health and social contact measures in an adult population in seven European cities.

2. Materials and methods

2.1. Study design and population

A longitudinal study was performed in seven European cities (Antwerp, Barcelona, London, Örebro, Rome, Vienna, and Zurich) as part of the PASTA project (Gerike et al., 2016). Participants were recruited opportunistically on a rolling basis between November 2014 and November 2016. Participants were 18 years of age or older (16 years of age or older in Zurich) and lived, worked and/or studied in one of the case-study cities (Gaupp-Berghausen et al., n.d.). Participants responded to two comprehensive questionnaires (baseline and final) asking for their socio-demographics, travel behaviour, and different health measures, using an on-line survey platform (details of measures obtained from each questionnaire in Supplementary material Fig. S1). The baseline questionnaire was active between November 2014 and January 2017, and in November 2016 all registered participants were invited to complete the final questionnaire. Between the two questionnaires there was not any specific intervention designed by the study, the participants were doing their normal life. The questions were developed first in English and then translated into Dutch, Spanish, Catalan, Swedish, Italian, and German. The study protocol was approved by the ethics committees from the different case-study cities and written informed consent was obtained from all participants.

2.2. Transport mode use

The PASTA longitudinal study assessed transport mode use in the baseline and final questionnaires by asking: “How often do you currently use each of the following methods of travel to get to and from places?” with possible transport modes being: car or van/public transport/motorcycle or moped/electric bicycle/bicycle/walk. Answers for each transport mode were rated on a five-point scale ranging from “Daily or almost daily” to “Never”. Each transport mode was converted to a continuous variable assigning a value (frequency) to each of the categories of the scale: “Daily or almost daily” = 24 days per month; “on 1–3 days per week” = 8 days per month; “on 1–3 days per month” = 2 days per month; “Less than once per month” = 1 day per month; “Never” = 0 days per month. We created an additional variable for each transport mode calculating the mean between the two questionnaires as a proxy of long-term use.

As part of the sensitivity analyses, we created dichotomous variables for each transport mode use. First, we created two categories using the original scale: “at least once per week” (Daily or almost daily/on 1–3 days per week) and “less than once per week” (on 1–3 days per month/Less than once per month/Never). Second, we dichotomized the mean variables using the value 5 as a cut-off and used the same categories as the previous one (“at least once per week” and “less than once per week”). We considered “less than once per week” answers as the reference category.

2.3. Health and social contact measures

Our main outcome was self-perceived health. We used the scale from The Medical Outcome Study Short Form (SF-36) asking participants: “In general, how would you say your health is?” with possible responses being: excellent/very good/good/fair/poor. The answers were dichotomized by whether people had a “good self-perceived health” (excellent/very good/good) or “poor self-perceived health” (fair/poor), following the same methodology used in previous studies (Dadvand et al., 2016). We considered “poor self-perceived health” answers as the reference category, therefore a positive association between transport mode use and this variable could be interpreted as good self-perceived health. Self-perceived health was measured in the baseline and in the final questionnaires.

We used three mental health measures: perceived stress, mental health, and vitality. First, perceived stress was measured using the short version of the Perceived Stress Scale (PSS-4) (Cohen et al., 1983). The instrument contains four statements, which measure how unpredictable, uncontrollable, and overloaded respondents feel that their lives are. The higher the score on the PSS-4 (from 0 to 16), the greater the respondent perceives that their demands exceed their ability to cope. Second, to measure mental health we used the 5-item mental health scale of SF-36 (MHI-5). It includes items from each of the four major mental health dimensions (anxiety, depression, loss of behavioural/emotional control, and psychological well-being). The lowest value possible (floor) would be “feelings of nervousness and depression all of the time” and the highest possible (ceiling) would be for someone who “feels peaceful, happy, and calm all of the time” (Ware et al., 1993). Third, we used a four-item measure of vitality (energy level and fatigue) from SF-36 which captures differences in subjective well-being.