Applying Behavioural Insights to Sustainable Mobility Behaviour

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Abstract

The present study is an ongoing research project that focuses on the application of behavioural science to sustainable mobility behaviour. The research project aims to experimentally test different behavioural interventions, designed to promote and facilitate the use of sustainable transport practices, and provide recommendations for mobility management policies and strategies. The research also focuses on the relationship between individual heterogeneity and sustainable mobility behaviour and addresses the question of behavioural insights' knowledge among transport planners and policy-makers.

Framing of the research. *Air pollution is one of Europe's biggest environmental health risks (European Environmental Agency, 2022). According to Legambiente (2023), air pollution is decreasing too slowly in Italian cities. This makes the latest recommendations of the World Health Organization (WHO, 2021) more difficult to achieve. Although there is no single cause, urban traffic is one of the main sources of common air pollutants. Urban traffic is affecting the quality of life of residents not only through pollution and safety issues but also through road congestion and other driving-related issues (lack of parking areas, noise, territorial impacts, etc.). This makes necessary a shift from private car mobility—considered as the less sustainable level of transport (Waygood and Avinery, 2013), to alternative modes. In this framework, the understanding of the decision-making processes underlying mobility behaviour can be critical to providing clear context and guidance for effective sustainable urban mobility.*

To date, decision mechanisms shaping mobility behaviour are affected by cognitive biases that can prevent individuals from exercising a rational choice and cost-benefit analysis (Avineri, 2012). For instance, over- and underestimation of Local Public Transport (LPT) features, such as costs or travel time, can have potential negative consequences on the perception of service quality and the demand for public transport services. If this occurs, a change in the quality of services provided alone cannot necessarily support the use of public transport in favour of individual mobility options. Moreover, the choice of transport mode has been found to be characterized by high levels of habit formation in consumption preferences that can be difficult to break (Mackett and Robertson, 2000).

A promising approach to the problem is promoting more sustainable mobility decisions through the use of Behavioural Insights (BIs) tools. The BIs term was coined in 2010 by the UK's Behavioral Insights Team (BIT). BIs can be defined as "an inductive approach to policymaking that combines insights from psychology, cognitive science, and social science with empirically-tested results to discover how humans actually make choices" (Organization for economic cooperation and development - OECD, 2023). This approach applies behavioural science to the study of decision-making by direct observation of people's beliefs and decisions, starting from the dual-system model where our decisions often rely on and are driven by unconscious and automatic processes, rather than deliberative ones (Kahneman, 2012). In some cases, these automatic processes may introduce biases that affect individual actions with possible negative consequences for subjective and community well-being (Thaler and Sunstein, 2021; Kahneman, 2012; Frederick et al., 2002; Loewenstein and Prelec, 1992; Tversky and Kahneman, 1992; Thaler, 1981; Kahneman and Tversky, 1979). For example, according to the sunk cost effect, people may "continue an endeavor once an investment in money, effort, or time has been made" (Arkes and Blumer, 1985, p.1). In line with this view, individuals may prefer the private car as a transport mode since they are already paying for the costs of owning their vehicle.

Different BIs methodological framework exists. For instance, the BASIC toolkit (Behaviours, Analysis, Strategies, Interventions, and Change; OECD, 2019) or the MINDSPACE (Messenger, Incentives, Norms, Defaults, Salience, Priming, Affect, Commitments, Ego; BIT, 2010; see also Dolan et al., 2012). Nevertheless, one thing all these tools have in common is the underlying structure, which must contain the identification of the behavioural drivers of the target problem, the possible strategies to be implemented, and the preliminary testing of the identified approaches before a large-scale intervention. BIs make extensive use of experimental designs, especially Randomized Control Trials (RCTs) and can be applied in a variety of research areas (e.g., Soman and Yeung, 2021; Viale e Macchi, 2021; Bucher, 2020; Mondino, 2019; Teraji, 2018; Halpern, 2015; Wendel, 2013). Moreover, the strategies that can be implemented in the BIs approach can be of different types. Among them, we can particularly find nudges which have been defined as "any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention

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*must be easy and cheap to avoid. Nudges are not mandates. Putting the fruit at eye level counts as a nudge. Banning junk food does not." (Thaler and Sunstein, 2008, p.6; see also Thaler and Sunstein, 2021; Sunstein, 2017). Nudges have roots in behavioural economics (Thaler, 2018; Kahneman, 2012). Notably, they can take the form of defaults, feedback, graphic warnings, social norms and peer comparison, in terms of sustainable mobility behaviour (Metcalfe and Dolan, 2012; Toledo, 2008), or even of specific choice architecture characteristics (*Gössling*, 2013; Pucher and Buehler, 2008). BIs' strategies can however take different shapes, characterized by different levels of paternalism. Namely, the boosting approach is an ensemble strategy in which cognitive and motivational competencies are targeted to promote individual competencies (e.g., communication, information, and disclosure; see Hertwig and Grüne-Yanoff, 2017; Grüne-Yanoff and Hertwig, 2016).*

As applied to mobility choice, a variety of behavioural drivers and strategies have been already identified (e.g., Stockhammer et al., 2021; Tørnblad et al., 2014; Innocenti et al., 2013; Avineri and Goodwin, 2010). Among others, we can find the use of default options and social norms, and the framing of information (Pietroni and De Rosa, 2021; Ortman et al., 2017; Lehner et al., 2016; Mattauch et al., 2015). Larrick and Soll (2008) found that the use of "miles per gallon", rather than "gallons per mile", seems to relate to an underestimation in the valuation of replacement of inefficient vehicles due to systematic misunderstanding of the measure of fuel efficiency. Also, Bartle et al. (2013) showed that user-generated information can be used for promoting sustainable mobility behaviour within a group commuting to work, particularly among those who lack information because they are new to the workplace/transportation mode. As for default options, Pedersen et al. (2011) found that habitual car users tend to underestimate their satisfaction with public transport which indeed increased in the sample after using LPT for a full month. As noted earlier, habits can be initially difficult to break. However, using the behavioural approach, simple plans can be implemented to remove the identified driver by proceeding in small steps (the participants were indeed travelling free of charge).

Despite these encouraging results, however, the application of behavioural science—especially with respect to sustainable mobility, is quite recent and even a more clear-cut definition of BIs is needed (Hallsworth and Kirkman, 2020); not to mention that the heterogeneity in people's responses to different strategies may reduce the replicability of the intervention at intra- and inter-individual levels, thereby increasing the context-dependence (Lehner et al., 2016). If, on one hand, the available evidence is not completely sufficient, and further investigation is required, on the other hand, publication bias can enhance the true size effect of strategies whose results have been published. Moreover, once an intervention has been found to be successful on a large-scale level, the effects of the identified approaches are not necessarily long-term. For instance, Gravert and Collentine (2021) recently found that long-term habit formation is stimulated by economic incentives (trial period) but not by social norms. The role of infrastructure and the quality of the service, to be considered as a hard measure to stimulate sustainable mobility, as well plays a crucial role in mobility behaviour (Fraquelli, 2021).

Another crucial aspect is that travel preference can be considered a social dilemma in which people must cooperate to achieve the group's interest (Fujii and Taniguchi, 2006; Fujii et al., 2001). This widens the mobility choice into a social decision problem, possibly of moral value, and creates the need for control of additional variables, such as altruism proxies or risk-taking propensity, and identification of individuals that may be more cooperative.

Purpose of the paper. *Moving from the framing of the research, the present study aims to test different types of behavioural interventions promoting and facilitating the use of sustainable mobility, particularly local public transport. We also want to test whether individual heterogeneity may influence sustainable mobility behaviour and assess the level of knowledge on BIs among transport planners and policy-makers.*

The are three main hypotheses to be tested. The first hypothesis (H1) is that, overall, classical economic incentives promote better than BIs sustainable mobility. However, according to the second hypothesis (H2), BIs strategies are more effective for certain segments of individuals (i.e., depending on the cultural and social context, attitude towards sustainable mobility and the LPT, and biased decision-making processes). The third and last hypothesis (H3) predicts that the level of knowledge on behavioural science approaches among transport planners and policy-makers remains limited.

Methodology. *The study is an ongoing research project. To test the hypotheses outlined in the previous section, we intend to conduct a randomized experiment, accompanied by a post-experiment survey questionnaire, and a qualitative semi-structured, in-depth interview.*

More specifically, as for H1, three different types of intervention will be tested using a between-subjects design: economic incentive, nudging, and boosting. Participants will be asked to complete a decision-making task including a choice experiment on sustainable mobility. In this experiment, each type of intervention corresponds to a treatment. Subjects will be assigned an economic incentive in one treatment. In the other two treatments, they will be instead presented with a stimulus targeting the automatic processes (nudging treatment) or information targeting the cognitive system (boosting treatment). A control condition will be included. Immediately after the between-subjects experiment, to test H2, all the participants will be administered the post-experimental questionnaire including socio-demographics items, public transport attitudes and preferences, and measures of economic preference, including such as intertemporal choice and pro-social behaviour. This part of the study is expected to be tested on a large-scale trial, by using online platforms, after a preliminary pilot experiment.

Finally, the H3 hypothesis will be examined using qualitative semi-structured, in-depth interviews, to be conducted among selected transport planners and policy-makers, eliciting the level of knowledge on BIs as applied to sustainable mobility behaviour.

A pre-registration of the study design will address the publication bias and other related issues.

Expected results. *In line with the outlined hypothesis, we expect that BIs strategies are more effective for certain subgroups and that the segmentation of individuals can take into account the behavioural drivers underlying their decision-making in sustainable mobility. As for the behavioural science approaches among transport planners and policy-makers, we expect to confirm the hypothesis that the level of knowledge remains limited and, if not, BIs strategies are only slightly applied and are not typically part of the set of actual policy instruments. We also expect that the two parts of the study will provide recommendations for policy implications and future research directions.*

Research limitations. *The present study has limitations that might provide opportunities for future research. First, the experiment is not testing the long-term effects of the identified approaches. This can be further investigated by observing decision-making from experience rather than description, using a field experiment. Second, each experimental procedure has its drawbacks (Bateman et al., 2002; Pearmain, et al., 1991). As a result, to reduce this limitation, alternative procedures should be also tested in conjunction with choice experiments to compare the obtained results. The same applies to qualitative semi-structured, in-depth interviews. Finally, the use of BIs such as nudging has been criticised, especially about the manipulation of choice with potential ethical issues (e.g., Madi, 2020). We intend to address this limitation by providing a detailed discussion in the full-length version paper. However, future research can also address this issue by assessing subjects' acceptability and preference for different policy interventions.*

Managerial implications. *The results of this study are supposed to provide relevant suggestions for mobility management in promoting sustainable transport. In this regard, the present study aims to identify the strategies that can be more effective in formulating mobility policies at different levels and that would be suitable for changing travellers' attitudes and behaviour—particularly private car mobility, in favour of more sustainable modes of transport. Furthermore, the results of this study can be expected to recommend where mobility management programmes may have more impact (households, workplaces, etc.). Policy-makers can make large use of behavioural evidence and, since the proposed strategies are relatively low-cost measures, the sustainable mobility approaches can result in a high benefit-cost ratio. In addition, not only the results may be informative for promoting new programmes, but for communication strategies as well. The qualitative interview can eventually improve the effectiveness of managers in the mobility area, or at least provide some useful insights into how to include behavioural science in their work.*

Originality of the paper. *Although previous studies have already addressed the importance of behavioural science in mobility choice, to the best of our knowledge, the literature is still very limited when compared with more traditional approaches, mainly focusing on acceptability and socio-demographics (e.g., Loukopoulos et al., 2005; Thorpe et al., 2000). Most importantly, the originality of this paper lies in the simultaneous testing of such different behavioural interventions aimed to promote and facilitate the use of sustainable transport practices. Equally important is the use of segmentation, taking account of the heterogeneity of mobility behaviour, and the use of both qualitative and quantitative measures. Finally, the present study has important implications for both practice and theory since better deliberative processes that occur between transport planners/policy-makers and individual users can be shaped. This in turn has important implications for promoting residents' safety and decreasing the global and local impacts of unsustainable mobility behaviour.*

Keywords: *Behavioural insights; Mobility behaviour; Sustainable development, Experiment, Survey, Qualitative interview.*

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