

Psychosocial determinants of public transportation use among Brazilian and American users: An integrated modelling approach

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RESUMO

Determinantes psicossociais do uso do transporte público

A dependência excessiva dos automóveis pode promover problemas individuais, ambientais, econômicos e sociais, exigindo o desenvolvimento de medidas para reduzir a utilização do automóvel e incentivar a utilização de opções de transporte mais sustentáveis. Visando contribuir para esta temática, realizamos um estudo transcultural no Brasil ($n = 312$) e nos Estados Unidos ($n = 518$), investigando a aplicabilidade do modelo de Bamberg e Möser na previsão do uso do transporte público. Os resultados indicaram que o modelo é equivalente entre as amostras, tanto nas medidas quanto nas relações entre as variáveis do modelo. A intenção previu fortemente o comportamento de uso do transporte público, explicando 70% da variância. A intenção, por sua vez, foi influenciada principalmente pelo controle comportamental percebido, sugerindo que, quanto mais as pessoas percebem o transporte público como um comportamento passível de ser realizado, maior é a intenção de utilizar este modo de transporte. Sugerimos intervenções para aumentar o controle comportamental percebido, para que o transporte público possa ser visto como uma opção facilmente acessível. Estima-se que controle comportamental percebido e intenção de usar o transporte público poderiam ser aumentados com o fornecimento de informações, o incentivo ao uso e a melhoria da qualidade do serviço.

Palavras-chave: uso de transporte público, determinantes psicossociais, comportamento de viagem.

ABSTRACT

Overreliance on cars can promote individual, environmental, economic and social problems, requiring the development of measures to reduce car use and encourage the use of more sustainable transport options. Contributing to this call, here we report a cross-cultural study conducted in Brazil ($n = 312$) and the United States ($n = 518$) investigating the applicability of the model of Bamberg and Möser in predicting the use of public transport. Results indicated the model is equivalent across samples, regarding both the measures and the relations between the variables of the model. Intention strongly predicted self-reported public transport behaviour, explaining 70% of the variance. Intention in turn was mainly influenced by perceived behavioural control, suggesting that the more people perceive public transportation as an easy behaviour, the greater their intention to use this mode of transport. We suggest interventions to increase perceived control so that public transportation can be seen as a readily accessible option. It is estimated that perceived behavioural control, and intention to use public transportation could be increased by providing information, encouraging the use, and improving the service quality.

Palavras-chave: public transportation use; psychosocial determinants; travel behaviour.

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Public transportation can reduce the excessive use of cars and its negative impacts, such as traffic congestion, accidents, damages to health, noise, pollution and the misuse of energy (Hartig, 2007; International Energy Agency, 2022; van Wee, 2007). However, the efficiency of strategies to promote the use of public transportation depends on how users are willing to switch to other transportation modes in daily commuting (Schlag & Schade, 2004).

Public transportation often faces negative users' perceptions (Eriksson et al., 2013), and people who feel unsafe or uncomfortable in public transport may use strategies to avoid it (Ceccato & Loukaitou-Sideris, 2021; Stjernborg, 2024). Long waiting and traveling times, expensive taxes, unsatisfactory treatment by employees, and lack of punctuality are some of the problems reported by the users (Fellsson & Friman, 2008; Hensher et al., 2003). Aspects such as lack of cleanliness, privacy, safety, and convenience, as well as increased stress and unwanted social interaction, may negatively affect users' satisfaction (Stradling et al., 2007). Passengers seek public transport that is safe, convenient, reliable, comfortable, economical, and well-equipped (Zhang et al., 2022).

Understanding what leads people to use public transportation is important for developing effective transportation policies. Using psychological theories to explain travel mode choices can provide critical information on how individual characteristics influence users' behavior (Kariuki et al., 2020). This research investigates the factors that influence individuals' intentions and behaviors toward public transportation usage. We conducted a study in a Brazilian and in an American city, to test the applicability of a theoretical integrated model (Bamberg & Möser, 2007).

Three main theoretical models have been used to understand the psychological determinants of the use of public transportation: 1) Ajzen's Theory of Planned Behavior (TPB), 2) Schwartz's Norm Activation Model Theory (NAM), and 3) Stern, and colleagues Value-Belief-Norm Theory (VBN) (Bamberg et al., 2007; Bamberg et al., 2003; Hunecke et al., 2001; Klöckner, & Friedrichsmeier, 2011; Nordlund & Westin, 2013). According to the TPB, attitude, subjective norm, and perceived behavioral control together, lead to the formation of behavioral intention, which is the immediate antecedent of the behavior. In the NAM theory, personal norm, perception of the consequences and responsibility attribution influence behavior, while in the VBN theory, behavior is impacted by personal values, environmental beliefs, and personal.

In order to increase the explanatory power of the antecedents being investigated, several researchers have tried to combine or modify these models. Heath and Gifford (2002) included in the TPB model the influence of personal norms and problem awareness caused by the excessive car use in the prediction of the bus usage. Attribution of responsibility, awareness of the consequences (Bamberg et

al., 2003), and feelings of guilt (Bamberg et al., 2007) were also added in the explanation of what leads people to feel morally obligated to use more sustainable transportation modes.

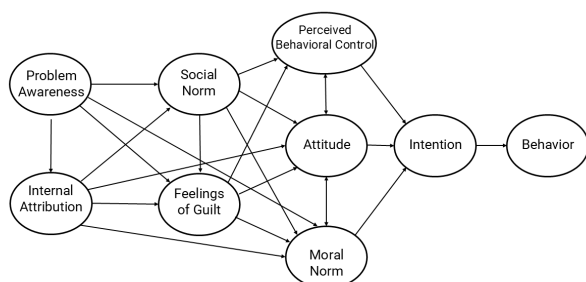
In a study on subway use, Hunecke et al. (2001) proposed a new theoretical model, including personal norms as a variable that influences behavior, being activated by the perception of the consequences, subjective norms and feelings of guilt. In another study, Klöckner and Friedrichsmeier (2011) partially confirmed the TPB model, indicating that intention and perceived behavioral control were closely related. However, intention did not predict behavior, and it was not influenced by (personal and moral) norms. Heath and Gifford (2002) showed opposite results, finding that the personal norm and awareness of consequences contribute significantly to predicting the intention to take the bus. Combining VBN and TPB constructs, Nordlund and Westin (2013) showed that specific values and beliefs about a railway line in Sweden influence the intention to travel by train.

Kaewkluekloma et al. (2017) found that TPB constructs explained most part of the variance in the intention of using the Bus Rapid Transit system in Thailand. The subjective norm was the most important predictor of intention. In China, the intention of using low-carbon transportation modes was most influenced by attitude, subjective and personal norms, awareness of consequences, and ascription of responsibility, combining TBP and VBN theories (Liu et al., 2017). In a Brazilian study, the behavior was motivated by intention and attitude, as well as by the habit (Feitosa, 2018).

The studies using integrated models show divergent results, in terms of the main predictors of public transportation' use. While some studies corroborate the relationship originally foreseen in the theoretical frameworks, others refute it (Lanzini & Khan, 2017). Nonetheless, aggregating the variables is interesting to explain how travel behavior is established, contributing to the development of effective interventions in car use reduction (Bamberg et al., 2011).

Based on a meta-analysis of 46 studies, Bamberg and Möser (2007) identified the most frequently investigated psychosocial constructs in pro-environmental behavior studies (Figure 1). The left side of the model in Figure 1 includes NAM and VBN constructs that are important determinants of personal standards, such as problem awareness, internal attribution, and feelings of guilt. The right side of the model resembles TPB, except that it replaces social (or subjective) norms by moral (or personal) norms as a direct predictor of intention. The authors justify this change by explaining that moral norm influences behavior as tested by other studies (e.g., Abrahamse et al., 2009; Harland et al., 1999; Heath & Gifford, 2002; Wall et al., 2007).

Figure 1. Psychosocial determinants of pro-environmental behavior (Bamberg & Möser, 2007)



The position of the moral norm in the model reveals that its formation may originate from the social norm, including social, cultural, and psychological factors. The resulting integrated model includes the essential constructs of NAM, VBN and TPB, except for personal values. This may indicate that studies on environmental behavior should focus more on NAM and TPB than on VBN theory (Morley et al., 2012). Table 1 presents the definition of the constructs of Bamberg and Möser (2007) model.

Morley et al. (2012) tested Bamberg and Moser's (2007) model and the results revealed that intention mediates the relationship between behavior and other constructs, similar to TPB. The perceived behavioral control and attitude were the main predictors of intention. Moral norms, however, were not significant predictors of intention, indicating that the participants do not feel morally obliged to use public transport. The results are similar to the original model, since the use of public transport is influenced by both self-interest and pro-social reasons. A study across eleven countries found attitudes to be the main predictor of pro-environmental behaviors (Miller et al., 2022). Mishra et al. (2024) emphasized the role of beliefs and social norms in encouraging sustainable transport. Culiberg et al. (2022) reported that environmental concern had little effect on intentions to reduce car use.

In this study, we aim to contribute to the ongoing discussion surrounding the application of integrated models in research related to travel mode choices. We seek to explore the impact of psychosocial constructs outlined in Bamberg and Möser's integrated model, taking into account two distinct samples. By doing so, we aim to provide insights into the psychosocial factors influencing public transportation use.

METHOD

STUDY SETTINGS

The research was conducted in two locations selected for convenience based on the authors' institutional affiliations:

the Federal District of Brazil (BR) and the Hampton Roads Region in the United States (US). The Federal District is part of the Central West of BR, with the federal capital Brasília. It comprises an estimated population of 3 million (IBGE, 2020), and it has two public transportation systems: a subway that is operated by the local government and private bus companies run by different enterprises (SEMOB, 2017). Overall, users evaluate the services negatively; complaints include poor drivers conduct, lack of buses, poor maintenance of vehicles, non-compliance with the schedule, noise, cleaning issues, delays, and assaults (Silva, 2014).

Table 1. Definition of the constructs of Bamberg and Möser integrated model.

Construct	Definition
Problem awareness	Awareness of the consequences of anti-environmental behavior
Internal attribution	Belief about one's own responsibility and about the ability to minimize threats to valuables objects
Social (or subjective) norm	Perception about other people's opinions and feeling of social pressure to act in a certain way
Feelings of guilt	Painful sensation of regret, awakened when the individual performs a behavior associated with an aversive event (real or anticipated)
Perceived behavioral control	Perception of the possibilities, resources and available capacity to carry out the behavior
Attitude	Evaluation (favorable or not) about a certain object
Moral (or personal) norm	Feeling of moral obligation to engage in pro-environmental behavior
Intention	Desire to behave in a certain way

Source: Adapted from Ajzen (1991); Bamberg e Möser (2007); Bamberg et al. (2007); Stern et al. (1999)

The Hampton Roads Region, in south-east Virginia, US, covers 11 counties/cities (VEDP, 2021), with an estimated population of 1.6 million people (Norfolk Development, 2014). The region's transportation system offers bus, light rail, and ferry services (Hampton Roads Transit, 2014). One of the difficulties in the region is the need to cross the waterways that surround it, through tunnels and bridges. Users seem to prefer paying tolls on bridges and tunnels rather than using public transport, suggesting a negative evaluation (Social

Science Research Center of Old Dominion University, 2014). The light rail is positively perceived as being less exposed to congestion problems, but the current configuration covers a few routes that do not correspond to the needs of the users (Hampton Roads Transportation Planning Organization, 2018).

Even though there are significant differences in the transportation system, in general, residents of both cities demonstrate a negative perception of public transportation. Thus, we aimed to understand if the psychological theoretical models are similar in both samples surveyed.

PARTICIPANTS

A total of 312 people answered the questionnaire in BR. The majority was female (65%), ranging from 18 to 63 years of age ($M = 33.28$; $SD = 10.48$). Most were undergraduate (33%) or graduate (28%) students. Some 91% of the participants reported having a driver's license. A total of 518 individuals participated from the US, with 76% being female, ranging from 18 to 26 years of age ($M = 20.00$, $SD = 2.07$). All the participants were undergraduate students and 99% had a driver's license.

INSTRUMENT

We adapted the instrument developed by Bamberg et al. (2007) to Portuguese and to American English, as reported by Neto et al. (2019). The instrument consists of four parts. The first part comprised 19 items measuring social norm, moral norm, perceived behavioral control, internal attribution, awareness of problems, and feelings of guilt. These items were rated on a 5-point Likert scale (strongly disagree - strongly agree). The second part included seven items, arranged in a semantic differential subscale, using poles of adjectives (good-bad, possible-impossible) to measure attitude and intention. The third part had five items, arranged in a frequency subscale regarding the use of public transportation during the week (never - always), as well as the use of public transportation to engage in four different daily activities (i.e., work/study, leisure, sport, shopping/supermarket). Finally, socio-demographic questions were presented.

PROCEDURES

In both locations, data were collected via online surveys. In the US sample, data were gathered through the university's data collection system, which allows students to view a list of surveys available and enroll in studies of their choice. In Brazil, lacking a university data collection system, we first shared a Google Survey on social media and asked respondents to forward it to others, using the snowball method.

Data analysis was performed with the aid of the software Amos 22, using the maximum likelihood to improve the parameter estimates through iterations and minimize the specified adjustment function (Hair et al., 2009). Three preliminary procedures were used: single-group Confirmatory Factor Analyses (CFA), measurement invariance, and structural relationship invariance.

We undertook two-separated CFA for each sample, using the covariance between the constructs as input, as recommended by Byrne (2009). This preliminary analysis tests the fit of the theoretical model with the empirical data from each group. We then performed a multi-group CFA simultaneously in both groups to verify if the instruments measure the same constructs in each sample. This analysis allows for investigating if the respondents understood the items in an equivalent way (Hui & Triandis, 1985; Milfont & Fisher, 2010).

We carried out a test of the invariance of structural (or causal) relationships simultaneously in both groups using Bamberg and Möser's model (2007) as a basis for the estimation of structural equations. This analysis allows identifying whether the structural relationships between the constructs are similar in both groups. The difference between the two models was tested: one in which all parameters of the structural part are forced to be equivalent between groups (forced model) and another in which all parameters are freely estimated (free model). Finally, we analyzed the structural relationships between the latent variables, indicating the standardized structural coefficients of each path and the explained variance of each construct in the model.

RESULTS

SINGLE GROUP CFA

After conducting preliminary analyses, most standardized factor loadings exceeded 0.50, which is considered as adequate by Hair et al. (2009). Nine items were excluded due to measurement issues, such as lower-than-expected factor loadings or a notable decrease in the CFA model fit indices, which may indicate systematic measurement errors (Byrne, 2009). The items retained in the final version of the scale and their factor loadings are listed in Appendix 1. The CFA showed satisfactory model fit indices for the BR group ($\chi^2 = 480.803$; $df = 282$; $\chi^2/df = 1.70$; SRMR = .0058; CFI = .94; GFI = .90; RMSEA = .048 [90% CI = .044, .055]), as well as for the US group ($\chi^2 = 720.937$; $df = 333$; $\chi^2/df = 2.16$; SRMR = .0052; CFI = .93; GFI = .91; RMSEA = .048 [90% CI = .043, .052]), indicating that the theoretical model fits the data collected in both samples.

MEASUREMENT INVARIANCE

Table 2 presents the results of the common measurement invariance tests, which aim to analyze if the scale is interpreted the same way across different groups, implying that the underlying factor structure and the way items relate to that factor are equivalent.

Table 2. Fit indices for common measurement invariance tests

Model		
Full configural invariance	χ^2 (df)	680.255 (338)
	$\Delta\chi^2$ (Δ df)	-
	χ^2 /df	2.01
	SRMR	.041
	CFI	.95
	Δ CFI	-
	RMSEA (90% CI)	.035 (.031 – .039)
	AIC	1016.255
	ECVI (90% CI)	1.229 (1.144 – 1.324)
	Decision	Accept
Full metric invariance	χ^2 (df)	702.826 (351)
	$\Delta\chi^2$ (Δ df)	22.571 (13)
	χ^2 /df	2.00
	SRMR	.041
	CFI	.95
	Δ CFI	.00
	RMSEA (90% CI)	.035 (.031 – .039)
	AIC	1012.826
	ECVI (90% CI)	1.225 (1.138 – 1.321)
	Decision	Accept
Problem awareness scale	χ^2 (df)	684.873 (339)
	$\Delta\chi^2$ (Δ df)	4.618
	χ^2 /df	2.02
	SRMR	.041
	CFI	.95
	Δ CFI	.00
	RMSEA (90% CI)	.035 (.031 – .039)
	AIC	1018.873
	ECVI (90% CI)	1.232 (1.146 – 1.327)
	Decision	Accept
Internal attribution scale	χ^2 (df)	682.712 (340)
	$\Delta\chi^2$ (Δ df)	2.457 (2)
	χ^2 /df	2.00

Model		
	SRMR	.041
	CFI	.95
	Δ CFI	.00
	RMSEA (90% CI)	.035 (.031 – .039)
	AIC	1014.712
	ECVI (90% CI)	1.227 (1.142 – 1.322)
	Decision	Accept
	χ^2 (df)	681.240 (339)
	$\Delta\chi^2$ (Δ df)	.985 (1)
	χ^2 /df	2.01
Social norm scale	SRMR	.041
	CFI	.95
	Δ CFI	.00
	RMSEA (90% CI)	.035 (.031 – .039)
	AIC	1015.240
	ECVI (90% CI)	1.228 (1.142 – 1.322)
	Decision	Accept
	χ^2 (df)	680.297 (339)
	$\Delta\chi^2$ (Δ df)	.042 (1)
	χ^2 /df	2.00
Feelings of guilt scale	SRMR	.041
	CFI	.95
	Δ CFI	.00
	RMSEA (90% CI)	.035 (.031 – .039)
	AIC	1014.297
	ECVI (90% CI)	1.226 (1.141 – 1.321)
	Decision	Accept
	χ^2 (df)	680.886 (339)
	$\Delta\chi^2$ (Δ df)	.631 (1)
	χ^2 /df	2.00
PBC scale	SRMR	.041
	CFI	.95
	Δ CFI	.00
	RMSEA (90% CI)	.035 (.031 – .039)
	AIC	1014.886
	ECVI (90% CI)	1.227 (1.142 – 1.322)
	Decision	Accept
	χ^2 (df)	682.853 (340)
	$\Delta\chi^2$ (Δ df)	2.598 (2)
	χ^2 /df	2.00

Model		
	χ^2/df	2.00
	SRMR	.041
	CFI	.95
	ΔCFI	.00
	RMSEA	.035
	(90% CI)	(.031 – .039)
	AIC	1014.853
	ECVI	1.227
	(90% CI)	(1.142 – 1.322)
	Decision	Accept
Moral norm scale	$\chi^2 (df)$	684.137 (339)
	$\Delta \chi^2 (\Delta df)$	3.882 (1)
	χ^2/df	2.01
	SRMR	.041
	CFI	.95
	ΔCFI	.00
	RMSEA	.035
	(90% CI)	(.031 – .039)
	AIC	1018.137
	ECVI	1.231
Intention scale	(90% CI)	(1.146 – 1.326)
	Decision	Accept
	$\chi^2 (df)$	683.128 (340)
	$\Delta \chi^2 (\Delta df)$	2.873 (2)
	χ^2/df	2.00
	SRMR	.041
	CFI	.95
	ΔCFI	.00
	RMSEA	.035
	(90% CI)	(.031 – .039)
Behavior	AIC	1015.128
	ECVI	1.227
	(90% CI)	(1.142 – 1.322)
	Decision	Accept
	$\chi^2 (df)$	684.746 (340)
	$\Delta \chi^2 (\Delta df)$	4.491 (2)
	χ^2/df	2.01
	SRMR	.042
	CFI	.95
	ΔCFI	.00
	RMSEA	.035
	(90% CI)	(.031 – .039)
	AIC	1016.746
	ECVI	1.229
	(90% CI)	(1.144 – 1.324)
	Decision	Accept

Model		
Full factor mean invariance	$\chi^2 (df)$	829.186 (391)
	$\Delta \chi^2 (\Delta df)$	148.931 (53)
	χ^2/df	2.12
	SRMR	.060
	CFI	.94
	ΔCFI	.01
	RMSEA	.037
	(90% CI)	(.033 – .040)
	AIC	1059.186
	ECVI	1.281
	(90% CI)	(1.185 – 1.386)
	Decision	Accept

The configural invariance model revealed that the postulated model fitted the two samples surveyed, suggesting that the underlying structure of the measurement model is equivalent across the groups being compared. The test of the full metric invariance model indicated that the relationship between the items and their respective constructs is similar in both groups. This result corroborates the results of the metric invariance tests performed for each of the subscales separately, as well as for the full factor mean invariance, which showed good fit indices.

Analyzing the SRMR, CFI, ΔCFI , RMSEA, AIC, and ECVI indices, there were a few changes in relation to the configural model. This result supports the equivalence between the measures of the models, revealing that the instrument measures the same psychological constructs in both groups, presenting a similar pattern of factor loadings.

STRUCTURAL RELATIONSHIP INVARIANCE

Table 3 presents the structural relationship invariance tests. No significant differences between the fit indices of the models were found.

Table 3. Structural relationship invariance tests.

Model	χ^2	df	p	χ^2/df	RMSEA (CI)	CFI	SRMR
Force d	960.612	393	.000	2.444	.042 (.038-.045)	.91	.79
Free	869.024	374	.000	2.324	.040 (.037-.043)	.92	.64
Δ	91.588	19	.000	0.120	.002	.01	.15

Thus, the structural relationship between the variables of the model is equivalent in both groups. In this case, Byrne (2009) recommends that data should be pooled and analyzed through single-group procedures. Therefore, we included all the 830 participants (312 from BR and 518 from the US) in the structural model.

STRUCTURAL MODEL

The indexes from the sample fit the theoretical model proposed by Bamberg and Möser (2007): $\chi^2 = 709.90$; $df = 187$; $\chi^2/df = 3.796$; SRMR = .051; CFI = .92; RMSEA = .058 [90% CI = .054, .063]. The structural model is shown in Figure 2.

Figure 2. Structural model

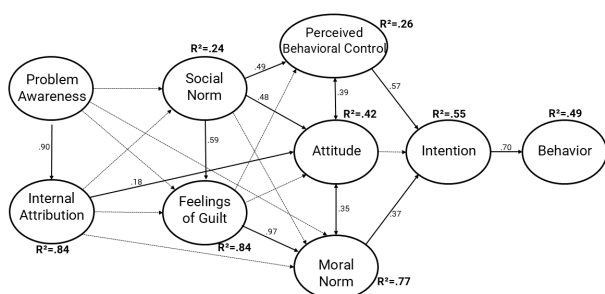


Figure 2 indicates that intention was a direct predictor of the behavior of using public transport, being, in turn, influenced by perceived behavioral control and personal norm, explaining 49% of the variance. The standardized structural coefficient between intention and behavior was high ($\beta = .70$).

Perceived behavioral control was the strongest predictor of intention ($\beta = .57$) and the moral norm was the second predictor ($\beta = .37$), explaining 55% of the variance. The attitude was not a significant predictor of intention. Twenty-six percent of the perceived behavioral variance is explained by social norms ($\beta = .49$) and attitude ($\beta = .39$). Seventy-seven percent (77%) of moral norms is explained by feelings of guilt ($\beta = .97$) and attitude ($\beta = .35$). Social norm, moral norm, and internal attribution are direct predictors of attitude ($\beta = .48$, $\beta = .35$, and $\beta = .18$), explaining 42% of the variance. Problem awareness indirectly predicts attitude, mediated by internal attribution ($\beta = .90$). Feelings of guilt, influenced by social norms ($\beta = .59$), indirectly impact attitude, mediated by moral norm ($\beta = .97$).

DISCUSSION

One strategy to reduce the excessive use of cars in urban centres is the promotion of public transportation usage. Several studies have investigated which psychological antecedents may impact this behavior, using different

theoretical models to demonstrate such relationships (Bamberg et al., 2003; 2007; Heath & Gifford, 2002; Hunecke et al., 2001; Kaewklungkloma et al., 2017; Klöckner & Friedrichsmeier, 2011; Liu et al., 2017; Nordlund & Westin, 2013). Here we tested the empirically driven model by Bamberg and Möser (2007) to predict the use of public transportation among BR and US citizens.

The results from the present study reveal that data collected in both groups adjusted satisfactorily to the Bamberg and Möser (2007) model, which corroborates the findings of previous studies (Bamberg et al., 2007; Morley et al., 2012). This result may be related both to the universality of the model tested (Berry et al., 2002) or due to similarities between the perception about public transportation in the cities investigated. In both regions surveyed public transportation tends to be negatively evaluated, having similar users' acceptance indicators.

The fact that intention was a direct predictor of behavior, influenced by perceived behavioral control and moral norm, partly confirms the TPB model and findings from previous studies (Bamberg & Möser, 2007; Bamberg et al., 2007; Morley et al., 2012). This result provides empirical evidence that intention is a valid predictor of public transport usage.

As for the antecedents of intention, perceived behavioral control was the strongest predictor, indicating that a significant part of the intention to use public transport stems from the perception that it is an easy and/or possible behavior to be performed. This result differs from the one originally proposed by Bamberg and Möser (2007), where the authors found a balance between the impact of perceived behavioral control, attitude, and personal norm in the intention. The feeling of moral obligation to use public transport being the second predictor of intention was also found by Bamberg et al. (2007). Morley et al. (2012), on the other hand, point to attitude as a second predictor. Thus, the differences regarding the second antecedent of the intention to use public transport are, therefore, inconsistent and point to the need for further investigation of the role of attitude and moral norms in predicting the intention to use public transport.

As for the relationship between attitude and intention, the results suggest that a favorable position toward the use of public transport does not appear to be a sufficient motivator for the intention to use it. This may be related to the negative perception of public transportation quality, showing that even if users tend to consider public transportation important, they do not actually desire to use it. It seems to highlight the force of perceived behavioral control on the intention, being more significant than simply judging public transport positively. It should be noted that perceived behavioral control was influenced by social norms and attitude, showing that people who believe it is possible to use public transport would feel pressured for not having behaved as socially expected. They would also evaluate public transport more positively.

The explained variance in perceived behavioral control was moderate ($R^2 = .26$), suggesting that other factors may explain what motivates people to perceive the use of public transport as something that can be accomplished or not. The presence of contextual factors not considered in this study, such as the low quality of services provided by the public transport sector, may impact the way that the individual perceives this mode of transport (Thøgersen, 2006).

Corroborating the findings of Bamberg et al. (2007) and Morley et al. (2012), the social norm was the greatest predictor of attitude. This reveals that the evaluation of public transport is influenced by social pressure (Bamberg & Möser, 2007). Moral norm was the second main predictor of attitude, revealing that individual and social aspects are more relevant in the formation of attitudes than the pro-environmental concern itself.

Moral norms were impacted by feelings of guilt and social norms, showing that feelings of moral obligation to use public transport is linked to the anticipation of guilt and social pressure of using this transportation mode. This result corroborates a perspective pointed out by Bamberg and Möser (2007) that the internalization of the moral norm is a process in which the meaning attributed to a given object is socially constructed and shared.

The study's findings provide valuable insights for devising intervention strategies to promote the use of public transport. Given that intention has been identified as a key predictor of behavior, interventions to promote public transport use should target the core determinants of intention identified in the TPB, i.e., attitudes, subjective norms, and perceived behavioral control. Providing comprehensive and accessible information about public transport routes, schedules, and ticketing systems can enhance perceived behavioral control by increasing users' knowledge and confidence in using the service (Ajzen, 1991). Implementing integrated fare systems or offering financial incentives, such as free passes, can improve attitudes toward public transport by increasing perceived convenience and economic value. Public campaigns highlighting the social benefits of public transport can strengthen subjective norms by making its use more socially desirable and expected.

Often, users consider using public transport to be painful or difficult to perform, as they do not know about the existence of specific lines, integration terminals, stopping points, or fare value. Thus, the more information about a transportation mode, the easier it is for the individual to decide whether to use it. In addition, it should be emphasized that the companies that provide public transport, as well as the public bodies that supervise them, play an important role in shaping the perception of behavioral control. Problems related to operating conditions, cleanliness, safety, and punctuality can have a negative impact on the way users perceive public transport, affecting their intention to use it

(Thøgersen, 2006). Thus, the perception that public transport is inefficient can reduce the intention to use it, encouraging car usage (Organization for Economic Co-operation and Development, 1996).

Given that the intention-behavior gap in this study was minimal, measures to encourage public transport use could focus on strengthening the intention itself through its psychological antecedents. It may guide policymakers to design targeted interventions that address the specific cognitive factors most relevant in this context.

The prominence of social aspects in shaping attitudes, surpassing pro-environmental concern, suggests that initiatives aimed at fostering a positive attitude toward public transport should not solely rely on environmental justifications. Instead, it should highlight the social impacts resulting from using public transport. For instance, rather than emphasizing its environmental benefits such as lower emissions, reduced environmental damage, and improved public health for future generations, a more effective approach could be highlighting how increased use of public transport enhances social interactions and strengthens the sense of community (Newman & Kenworthy, 2007). Additionally, emphasizing reduced accidents and traffic congestion (Organization for Economic Co-operation and Development & European Conference of Ministers of Transport, 2007) and enabling more equitable utilization of urban spaces (Litman, 2003) can further support the promotion of public transport usage.

This study contributes to the discussion on the usability of integrated models focusing on the psychological determinants in explaining sustainable behavior. The results suggest that Bamberg and Möser (2007) model is adequate to explain the use of public transport.

Intention was the key factor in opting to use public transportation, corroborating TPB model and previous studies (Bamberg & Möser, 2007; Bamberg et al., 2007; Morley et al., 2012). Perceived behavioral control was the strongest predictor of intention, being influenced by social norms and attitude. Social norms were the strongest predictors of attitude, showing the importance of social aspects in personal evaluation towards public transport, instead of pro-environmental concerns, corroborating previous research findings (Mishra et al., 2024; Culiberg et al., 2022).

Additional studies could investigate the role of attitude in predicting the intention to use public transportation. Urban planners and policymakers could use these findings to develop measures that encourage the use of public transportation, such as providing information about public transport or benefits to passengers.

As a limitation, the study relies on self-reported data, which may be subject to social desirability bias or other response biases. Because convenience sampling was

employed, and because the samples in both cities differed in terms of age distribution, our findings should be interpreted as preliminary insights. These results may help guide future, more representative research, but are not generalizable to the broader population, even within the same city or national context. Lastly, the study focuses on the psychosocial determinants of public transportation use and does not consider other factors such as public transportation availability, accessibility, and affordability, which could also influence its usage.

CONTRIBUTION OF EACH AUTHOR

I.L.N. participated in management, coordination of planning, execution of research activities, formulation or development of the general proposal and objectives of the study, formulation of methodological design, data analysis, production of the initial and final versions of the manuscript. H.G. and B.E.P. participated in the supervision and leadership of the research planning and execution activities in Brazil and in the United States, respectively. T.L.M. contributed to the application of statistical, mathematical, and computational analyses and to the review of the final version of the manuscript. P.W.G.T. participated in the co-supervision of the research planning and execution activities in Brazil and contributed to the review of the initial draft of the manuscript. C.M.C. contributed to the writing and editing of the final version of the manuscript.

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DECLARATION OF CONFLICTS OF INTEREST

The authors declare that they do not have conflicts of interest regarding the presente manuscript.

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Appendix 1 - Reliability of the measurements used in the model

Construct	Item	Factor loading (λ)	
		BR (n=311)	US (n=518)
Problem awareness	Car use is one of the main global environmental problems	0,60	0,64
	There is an urgent need to do something about the environmental pollution	0,55	0,71
Awareness of the consequences	I do not think my personal car use has a negative impact on the living quality of future generations	0,73	0,82
	When I drive, exhaust gases that endanger other people's health are emitted	0,60	0,80
	When I drive, exhaust gases that have a negative effect on the global climate system are emitted	0,61	0,78
Social norm	People who are close to me (e.g. friends and family) would support my decision to use public transport instead of the car for everyday trips	0,60	0,53
	People who are close to me (e.g. friends and family) think I should use public transport more and drive less for everyday trips	0,70	0,68
Guilt	When I use the car I do not feel guilty in terms of the environment	0,50	0,55
	If I always used my car, I would have a guilty conscience toward the environment	0,80	0,84
	For me, to use public transport instead of the car for everyday trips would be: Possible / Impossible	0,66	0,70
	In the next few days I can use public transport instead of the car for everyday trips. I am: Sure / Unsure	0,78	0,89
Attitude	I would not like to use public transport instead of the car for everyday trips	0,65	0,50
	For me, to use public transportation instead of the car for everyday trips would be: Pleasant / Unpleasant	0,78	0,78
	For me, to use public transportation instead of the car for everyday trips would be: Good / Bad	0,80	0,77
Personal norm	I feel obligated to use public transport for environmental reasons	0,67	0,69
	Regardless of what other people do, I feel obligated to use public transport because of my own values and principles	0,74	0,64
Intention	I intend to use public transport instead of the car in the next few weeks for everyday trips	0,80	0,67
	My intention to use public transport in the next few weeks instead of the car for trips is: Weak / Strong	0,77	0,87
	In the next few weeks I will use public transport for everyday trips. It is: Unlikely / Likely	0,83	0,80
Travel Behavior	On average how often do you use public transport?	0,88	0,84
	How often do you use public transportation for each of the 4 everyday trips: Work / school	0,94	0,82
	How often do you use public transportation for each of the 4 everyday trips: Recreation facilities	0,62	0,64