

**Beyond private-sphere pro-environmental action: Explaining shared mobility using the  
Theory of Planned Behavior and solidarity-oriented variables**

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**Highlights**

- Conceptualization of shared mobility as collaborative pro-environmental behavior
- Application of the Theory of Planned Behavior on shared mobility and integrated solidarity-oriented variables
- Results showed positive connections between social responsibility and collective response efficacy with shared mobility intention
- Social identification was no significant predictor of intention or self-reported shared mobility behavior
- Solidarity-oriented variables may complement models that aim to explain pro-environmental actions beyond the private-sphere that need social collaboration

Shared mobility behaviors potentially decrease negative environmental effects of the transport sector. Models such as the Theory of Planned Behavior have been widely used to explain primarily individual private-sphere pro-environmental behaviors (PEB). However, as shared mobility behaviors are not completely limited to the private-sphere, but require social collaboration, it is an open question if the TPB-variables are sufficient in explaining shared mobility behaviors. Solidarity-focused variables that put a stronger focus on social interactions may complement the TPB-variables meaningfully. In two university samples (Study 1: N = 261, Study 2: N = 1411), we tested associations between the TPB-variables and shared mobility behavioral intention using Structural Equation Modelling (SEM). Both studies confirmed attitude and social norms as significant predictors. However, perceived behavioral control was not related to shared mobility intention. Study 2 additionally investigated whether social responsibility, collective response efficacy and social identity are related to shared mobility. Results showed that social responsibility as well as collective response efficacy positively predicted shared mobility intention. In Logistic regressions, the psychological variables showed no consistent connections

to self-reported shared mobility behavior. We discuss the scope of solidarity-oriented variables to complementarily explain PEB beyond the private-sphere that need social collaboration.

*Shared mobility, Theory of Planned Behavior, solidarity, collective efficacy, social identity*

## **Plain Language Summary**

### **Background**

The widespread individual use of cars is a major problem, because its greenhouse gas emissions contribute to human-induced climate change. Measures therefore need to be taken to reduce these mobility-related emissions. One important step toward a sustainable mobility transformation is the use of shared types of mobility. They involve the collaborative use vehicles, such as sharing rides, cars or bikes. It is therefore interesting to explore why people use shared mobility and how more people can be motivated to use cars or bicycles in a shared way.

### **Why was this study done?**

While there are many studies that focus on the technical optimization of sharing systems, there are not as many studies that examine the psychological factors that influence the use of shared mobility. To explore psychological factors that may be related to shared mobility, we investigated the following aspects: attitude (perceived advantages of shared mobility in comparison to disadvantages), perceived behavioral control (the evaluation that everyday mobility can be organized with shared mobility), and social norms (the extent to which one's own social environment supports shared mobility).

To use shared mobility, often communication and cooperation with others is needed, for example when renting a car from another private person or when organizing shared rides. Therefore we also explored the following potential social factors and their connection to shared mobility: social responsibility (feeling of a responsibility toward others well-being), collective response efficacy (the

belief in positive effects of joint action) and social identification (felt identification with members of a social group, in our case: groups of the university).

#### **What did the researchers do and find?**

We conducted surveys at two different universities in Germany. The first sample consisted of 261 participants and the second sample had 1411 participants. Both surveys asked questions regarding the intention to use shared mobility and the frequency of shared mobility use. The surveys included also questions regarding the described psychological factors. We found statistically significant connections of attitude and social norm with the intention to use shared mobility. Furthermore, of the social factors, collective response efficacy and social responsibility were connected with the intention to use shared mobility options. However, those connections were weak and played therefore only a small role. We found no significant connections of the psychological factors to the self-reported shared mobility behavior.

#### **What do these findings mean?**

The most interesting result is that individuals who feel a responsibility toward others well-being (social responsibility), as well as individuals who belief in the positive effects of joint action (collective response efficacy), intent to use more often shared mobility options. Furthermore, the TPB was in our case only partly applicable to explain shared mobility. Also, the psychological factors we investigated had only a small value in explaining shared mobility intention and behavior. It can be assumed that infrastructural factors play a more important role in order to foster the use of shared mobility.

## Introduction

In recent years the call for a mobility transition especially in urban environments has become louder, as the transportation sector contributed to about one fourth to the EU-wide emitted greenhouse gases in 2019 (Destatis, 2023) and is related to a variety of environmental and health problems (Kumar et al., 2014). Therefore, the decrease of individual, private use of cars has a great potential to prevent greenhouse gases and increase public health (Nieuwenhuijsen & Khreis, 2016). Shared mobility has been discussed as a traffic optimization strategy, as it can increase the overall occupation rate of means of transport (Dill et al., 2019; Machado et al., 2018; Shaheen et al., 2020). While a great body of research exists regarding information and communication technologies aiming for a broad-scale implementation of shared mobility solutions (Cohen-Blankshtain & Rotem-Mindali, 2016), comparatively little psychological research has been conducted exploring reasons why people choose shared mobility options in their everyday life. Shared mobility can be understood as a collaborative form of pro-environmental behavior (PEB) that is not entirely located in the private-sphere, because social interactions and collaboration with others are necessary to realize this behavior. Recent research on collective climate action has shown that the consideration of variables from collective action research such as social identification and collective efficacy-beliefs play an important role in explaining collective PEBs (Bamberg et al., 2015; Furlong & Vignoles, 2021; Hamann et al., 2021; Landmann & Rohmann, 2020).

Inspired by those insights, we aim to expand the view on shared mobility behavior beyond the individual private-sphere by a stronger consideration of potentially motivating solidarity-oriented variables. For this purpose, we conducted two studies at two German universities.

First, we investigated whether the Theory of Planned Behavior (Ajzen, 1991) can be applied to explain shared mobility. Second, we investigated whether solidarity-oriented variables, namely social responsibility, collective response efficacy and social identity extend this model meaningfully.

## **Shared mobility as collaborative pro-environmental behavior in between private-sphere and collective action**

Shared mobility can be categorized into business-to-consumer (B2C) approaches, where a business offers shared mobility options to consumers, and peer-to-peer (P2P) forms, where the sharing is organized between private persons. An advantage of B2C forms of shared mobility is the decrease of structural barriers, since the provision of vehicles and purchase transactions are professionally organized. In the present paper, we focus on the investigation of the following shared mobility behaviors: first, sharing journeys with people from other households in one car (Ridesharing), second, lending one's private car to others (Lending To), third, renting a car from another private household or a carsharing company (Renting From) and forth, the use of bikesharing services (Bikesharing) (Shaheen, 2016; Standing et al., 2019).

In order to choose psychological predictors that are potentially related to shared mobility behaviors, a framework distinguishing different types of PEB is helpful. Stern (2000) suggests activism, nonactivist public-sphere behaviors, private-sphere behaviors and behaviors in organizations as four different types of PEB. Although this framework successfully classifies a wide range of PEBs - especially those with an clear private or public focus - it does not adequately capture behaviors well that are neither completely in the private, nor collective sphere (Hunecke, 2022a). Some authors therefore suggest to structure PEB along different spheres of influence starting at the private sphere, over the social network and the organizational sphere, up to the societal sphere (Amel et al., 2017; Blumenschein et al., 2022). Thereby, the private sphere is limited to affect a person's individual ecological footprint in the action domains of housing, mobility, nutrition, and consumption (Stern, 2000). In the social network sphere, PEB is embedded in a social context such as one's neighborhood. The organizational sphere includes acting pro-environmentally in organizations, for example in one's workplace (Blok et al., 2015). Shared mobility behavior can be located partly in the private-sphere, and partly in the sphere of social

networks since the behavior needs regular coordination with others – for example ridesharing and lending one's car to others (e.g., in the neighborhood).

### **Psychological factors related to shared mobility**

Multiple empirical studies have investigated psychological factors related to car use in general (Abrahamse et al., 2009; Gardner & Abraham, 2008). Different empirically-based frameworks have been developed to give an overview of motives of car use (e.g. Pronello & Gaborieau, 2018). Most of them refer to the TPB (Ajzen, 1991) which assumes that perceived behavioral control, social norms and attitude lead to a behavioral intention that is related to behavior.

Focusing on ridesharing, Julagasigorn et al. (2021) reviewed psychological factors potentially influencing ridesharing behavior and highlighted the TPB as one of the most widely used theories in this context. For example, Bachmann et al. (2018) tested an extended version of the TPB with carpooling passengers and drivers. Observed associations followed the theoretical propositions of TPB except attitude towards carpooling which was not significantly related to carpooling intention. Besides the application of the TPB to explain shared mobility behaviors (Mattia et al., 2019; Si et al., 2020; van Veldhoven et al., 2022), other contributing factors such as perceived compatibility with daily life were identified as important factors (Burghard & Scherrer, 2022; Hartl et al., 2020). Furthermore, the psychological need for car ownership was found to be negatively related to the intention to use car sharing systems (Paundra et al., 2017). Moreover, the personal importance to protect the environment as well as the personal ecological norm was found to be positively correlated to shared mobility behaviors (Burghard & Scherrer, 2022; Hunecke et al., 2021).

Regarding variables taking into account social interaction factors, some mostly qualitative studies suggest prosocial motives as drivers for carpooling. This includes the motive to socialize with others, helping others, feeling socially connected, and experiencing empathy through shared experience

(Julagasigorn et al., 2021). Beyond that, altruistic motives and an orientation towards social utility have been found to be related to ridesharing intentions (Say et al., 2021) and to collaborative consumption behavior in general (Roos & Hahn, 2019).

### **Solidarity-oriented variables as predictors of shared mobility**

In relation to PEB, prosocial motives have already been discussed, as not only biospheric values but also altruistic motives are connected to PEB (Hopper & Nielsen, 1991; Stern et al., 1993). Indicators of prosociality include altruism as well as the psychological traits honesty and humility (Otto et al., 2021). Especially, commons dilemmas are often used as a framework to point out the similarities of pro-environmental and prosocial action. Thereby, both nature- and commons-oriented decisions are needed to protect the common good. In this view, PEB can be conceptualized as a form of prosocial behavior that benefits all humanity (Klein et al., 2022). Prosociality is closely linked to the concept of solidarity, which can be described as a “feeling to hold together, an intention to stand for in each other [...] an attitude which prescribes joint action” (Bierhoff & Küpper, 1999, p.133). However, when it comes to putting those values into meaningful action, the belief that common goals can be achieved through joint action is crucial (Hunecke, 2022b, p. 89). Furthermore intertwined with collective action and collective efficacy beliefs is the identification with social groups that specify the social context in which the actions take place (van Zomeren et al., 2008).

In sum, a general solidarity orientation which includes taking social responsibility, believing in the effects of joint action and feeling as part of a group may explain shared mobility behaviors. Throughout the paper, we use the term solidarity-oriented variables to summarize social responsibility (e.g., values such as benevolence), collective response efficacy beliefs (e.g., belief in meaningful outcomes of collective action) and social identification (e.g., regarding groups that are involved in the collective action).

### ***Social Responsibility***

As mentioned above, social responsibility comprises the readiness to take responsibility for others, for example by considering the well-being of others in one's decisions (Berkowitz & Connor, 1966; Bierhoff & Neumann, 2006). In the context of sustainable behavior, the concept of social responsibility has been discussed by Hunecke (2022b). On an individual level, social responsibility is most appropriately conceptualized through values, specifically ones including the well-being of others, such as benevolence and universalism (Schwartz, 2012). At the core of solidarity is the perceived personal obligation to take social responsibility as well as the belief in a just world (Lerner, 1980). On a general level, with regard to shared mobility as a collaborative form of PEB, an orientation towards social responsibility could explain the tendency toward shared mobility behavior and intention. On a contextualized level, social responsibility with regard to a relevant social group may be a relevant factor to initiate collaborative PEB.

### ***Collective response efficacy***

Efficacy beliefs have been found to be highly relevant predictors in the pro-environmental context (Bamberg et al., 2015; Bamberg & Möser, 2007; Hanss & Böhm, 2010; Jugert et al., 2016; Landmann & Rohmann, 2020). The concept of self-efficacy is originally conceptualized as a general orientation that describes the degree to which individuals believe in their own abilities in order to achieve goals and master challenges (Bandura, 1977). However, efficacy beliefs can also refer to acting together in social groups, for example as collective efficacy beliefs (Koletsou & Mancy, 2011). Outcome efficacy can be described as the belief that the behavior will have the desired outcome and it was shown to be positively related to pro-environmental behaviors (Truelove, 2009). With the focus on collective behavior, we conceptualize collective response efficacy as the belief in the collective power of a group to achieve common group goals (Hunecke, 2022b, p. 89). We hypothesize that collective response

efficacy (agent-aim efficacy) may be a relevant factor in explaining shared mobility intention and behavior. In the more specific context of shared mobility and the social setting of the university, we understand collective response efficacy as the belief that the group of whom one identifies with (agent), can contribute to the goal to promote sustainable mobility (aim).

### ***Social identification***

Another predictor of collective action is the social identity (Agostini & van Zomeren, 2021; van Zomeren et al., 2008). In recent years there has been a call for stronger consideration and examination of social identification processes and its potentials to support pro-environmental action, especially collective forms of PEB (Fritsche et al., 2018; Schulte et al., 2020). In general, a person whose self-identity is more defined over a “we”, instead of only “I”, is more likely to engage in collective climate action (Fritsche et al., 2018; Schulte et al., 2020). However, there are differences depending on the type of social identity. While the connection between PEB and the identification with groups that support pro-environmental behaviors is relatively high (Bamberg et al., 2015; Vesely et al., 2021), moderate connections are expectable when the group is unrelated to pro-environmental topics (Vesely et al., 2021). Integrations of social identification approaches in the TPB have been suggested, but investigated rather rarely (Fielding et al., 2008; e.g. Fielding & Hornsey, 2016).

### **The present study**

The goals of the present paper are twofold. The first goal is to test whether the TPB can be applied to shared mobility. Although there has been a number of studies that investigated variables of the TPB in the context of shared mobility (Bachmann et al., 2018; Julagasigorn et al., 2021; Mattia et al., 2019; Si et al., 2020; van Veldhoven et al., 2022), they strongly differ in their concrete operationalization of the psychological constructs, are mostly not operationalized according to the recommendations by

Ajzen (2006) and often lack psychometric quality criteria. Furthermore, they mostly focus only on one specific behavior in the area of shared mobility and use only the intention as dependent variable. This makes it hard to compare those studies. By testing the TPB in the shared mobility context including different types of self-reported shared mobility behaviors, we conceptually replicate the results of the previous studies and get insights for the applicability in further investigations of collaborative PEBs. The second goal is to test whether the solidarity-oriented variables social responsibility, collective response efficacy and social identity are related to shared mobility intention and behavior and if they can extend the TPB in a meaningful way. Thereby, we investigate the solidarity-oriented variables on two levels: First, on a general level without explicit reference to shared mobility and, second, with the focus on sustainable mobility and the specific social context of the university. On the general level we focus on prosocial values, the general belief in meaningful effects of joint action, and identification with other members of the university. On a contextualized level, we adapt those constructs to the specific shared mobility context and groups individuals highly identify in the university. We assume that the contribution of the specific solidarity-oriented variables to explain shared mobility is stronger than the general variables. As the greatest amount of worldwide climate-relevant emissions is caused by western countries, investigating a sample from a highly educated western country seems appropriate. The central research questions can be summarized as follows:

- Research Question 1: Can the Theory of Planned Behavior be applied to shared mobility?
- Research Question 2: Do the solidarity-oriented variables Social Responsibility, Collective Response Efficacy and Social Identity increase incremental predictive validity beyond the variables of the TPB?

### **Method Study 1**

Data of the first study was collected in December 2018 during a research project with a focus on psychological barriers of shared car use (see details in Hunecke et al., 2021). To address RQ1 in the present study, we performed new analyzes in a subsample of the data, specifically the variables of the TPB.

### **Sampling Procedure**

We collected data from students studying in Dortmund, a major German city. We sent the invitation to participate in our online-survey through a central mailing list at the University of Applied Sciences and Arts Dortmund only for registered students. Additionally, we posted invitations in student groups on social media platforms and distributed paper-pencil versions of the survey in seminars. Our rationale for collecting about 200 cases was due to the goals of the project this survey was part of (see details in Hunecke et al., 2021). Overall, we collected 342 completed surveys. After removing cases with wrong answers on one or both of the two quality check items ( $n = 77$ ) and cases with missing data on the TPB-variables ( $n = 4$ ), the final sample was  $N = 261$ .

### **Participant Characteristics**

The sample contained 55.8 % females, 44.8 % males, and 0.3 % diversely gendered people. The majority reported a classic higher education entrance qualification ("Abitur"; 71.3 %) and some had a university degree (26.8 %). Participants majorly lived in a city with more than 100.000 residents (55.9 %). 41.1 % reported to have one car in their household or no car at all (23.4 %). Detailed participant characteristics are summarized in Table 1.

Table 1.

*Student Sample Characteristics (Study 1)*

Categories	<i>n</i>	%
Gender		
Male	117	44.8
Female	143	55.8
Other	1	0.3
Education		
Main school	1	0.3
Middle school	1	0.3
Higher education entrance qualification (Abitur)	186	71.3
University Degree	70	26.8
Other	3	1.1
Occupation		
Full-time employed	29	11.1
Part-time employed	50	19.2
Minijob	116	44.4
Currently not employed	41	15.7
Other	17	6.5
Not specified	8	3.1
Birthplace of participant and/or parents in Germany		
Yes	178	68.2
No	83	31.8
Population size place of residence		
Up to 20,000 residents	43	16.7
20,001 – 100,000 residents	68	26.1
100,000 and up residents	146	55.9
Not specified	4	1.5
Number of cars in household		
0	61	23.4
1	110	42.1
2	51	19.5
3	24	9.2
4 and more	11	4.2
Not specified	4	1.5
University is in same city than residence (commuter)		
Yes	143	54.8
No	117	44.8
Currently not studying	1	0.4

*Note.* *N* = 261. Participants were on average 24.1 years old (*SD* = 4.54) and had an average net income of 1078.85 Euros (*SD* = 791.33). 22 participants did not specify their age.

5 participants did not specify their income. Percentages were rounded.

## Measures

### ***Shared Car Use Behavior***

We measured three types of shared car use behaviors via self-reports: (1) lending a private car to others (Lending To), (2) renting a car from others (Renting From) and (3) travelling in a car with others (Ridesharing). Each behavior was captured with one item by rating the frequency on a 5-point scale (1 = *never* to 5 = *always*).

### ***Variables of the Theory of Planned Behavior***

Based on recommendations of Ajzen (2006), the variables of the TPB were operationalized with a focus on shared car use. Each construct was measured by three items and rated on a 5-point scale (1 = *not true* to 5 = *very true*): Intention (e.g., “In general, my goal is to frequently share cars.”), social norm (e.g., “Many of the people who are important to me think that I should share cars as often as possible.”), perceived behavioral control (e.g., “If I want to, it is easy for me to travel the distances in my everyday life with a shared car.”) and attitude (e.g., “I find the collaborative use of cars to be...” with the poles “inconvenient – convenient”).

### ***Quality Check items***

Two quality check items were integrated in the questionnaire. First, one instructed response item as attention check (“Quality check: Please select the option ‘agree little’.”). A second item at the end of the survey asked participants to indicate whether they have read the questions attentively and answered reliably (“Yes, I read the questions carefully and answered them honestly.” Or “No, my data should not be used.”).

## Data Analysis

Descriptive statistics, intercorrelations, and Cronbach's alphas of all psychological constructs are depicted in Table 2. As the shared mobility behavior items strongly deviated from normal distribution, they were dichotomized. Participants who reported to show the behavior at least rarely were assigned to the shared mobility user group (coded as 1), while those who reported to never show the respective behavior were assigned to the other non-user group (coded as 0).

To analyze RQ1, we performed Structural Equation Modeling (SEM) using the lavaan package (Rosseel, 2012). Because of the non-normal distribution of shared mobility behavior, we specified intention as dependent variable, and social norm, perceived behavioral control, as well as attitude as predictors. The model fit was evaluated by the Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). CFI and TLI of  $\geq 0.95$ , an RMSEA, and an SRMR of  $\leq 0.08$  indicate an acceptable fit (Hu & Bentler, 1999). We reported robust indices that were corrected for non-multivariate normal distributed data with the Satorra-Bentler correction (Satorra & Bentler, 1994).

To analyze shared mobility behavior as dependent variable and the TPB-variables as predictors, logistic regressions were performed with odds ratio (OR) as effect size. An OR greater than 1 indicates that participants are more likely to report the behavior when the respective predictor is high, whereas values smaller than 1 indicate less likelihood that participants report the behavior. The explained variance was estimated by Nagelkerkes pseudo-  $R^2$  (Nagelkerke, 1991).

Table 2.

*Means, standard deviations, and correlations (Study 1)*

Variable	<i>M</i>	<i>SD</i>	<i>A</i>	1	2	3	4	5	6
1. Intention	2.80	1.15	.87						
2. Perceived behavioral control	2.31	0.97	.77	.34**					
3. Social Norm	2.34	0.96	.82	.52**	.23**				
4. Attitude	2.95	0.91	.72	.54**	.46**	.37**			
5. Ridesharing behavior	-	-		.15*	.21**	.11	.24**		
6. Lending To behavior (N = 197)	-	-		.07	.01	-.02	.02	.00	
7. Renting From behavior (N = 260)	-	-		.14*	.05	.08	.11	-.03	.40**

*Note.* Shared mobility behavior (Ridesharing, Lending To, and Renting From behavior) was dichotomized. *N* = 261 (see deviations in the table). \* indicates  $p < .05$ , \*\* indicates  $p < .01$ .

### Results Study 1

The SEM with shared car use intention revealed a good fit (CFI = .97, TLI = .96, RMSEA = .059, 90% CI [.039; .078], SRMR = 0.53). Social norm ( $\beta = .40, p < .001$ ) as well as attitude ( $\beta = .48, p < .001$ ) were significantly related to the intention for shared car use, while perceived behavioral control was no significant predictor ( $\beta = 0.01, p = .860$ ). The explained variance in the intention was  $R^2 = .56$ . The results are depicted in Figure 1. Interestingly, on a bivariate level, perceived behavioral control and intention were significantly intercorrelated ( $r = .34, p < .001$ ). Three logistic regression models revealed only attitude as a significant predictor of ridesharing behavior ( $OR = .153, p = .033$ ), while none of the TPB-variables were significantly related to Renting From and Lending To behaviors (see Table 3).

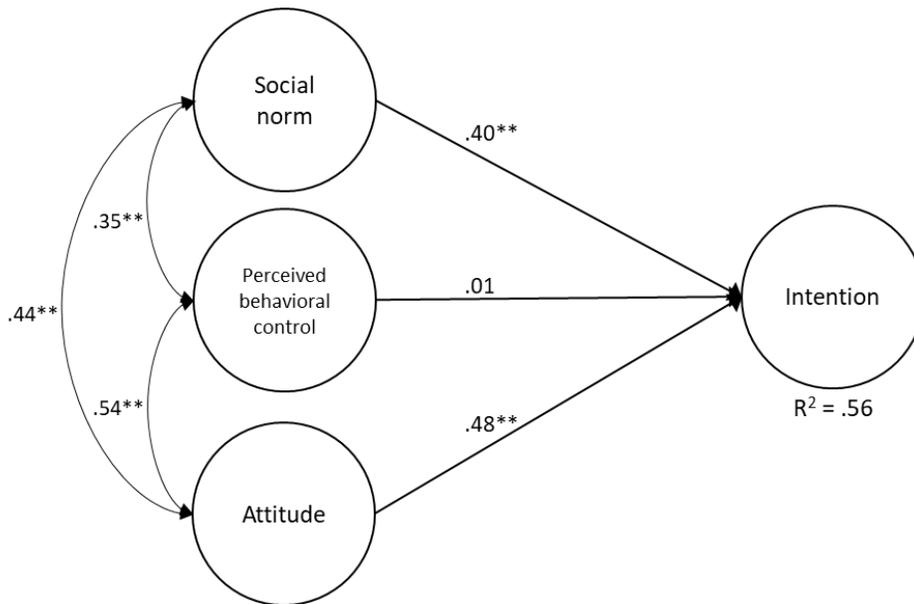


Figure 1: SEM with TPB-variables (Study 1).

Table 3: Logistic regression with shared mobility behaviors and TPB-variables as predictors (Study 1)

	Ridesharing behavior (N = 261 <sup>1</sup> )			Lending to behavior (N = 197 <sup>2</sup> )			Renting from Behavior (N = 260 <sup>3</sup> )		
	OR	p	CI (95%)	OR	p	CI (95%)	OR	p	CI (95%)
Intention	1.03	.850	0.75, 1.40	1.21	.244	0.88, 1.68	1.24	.141	0.93, 1.65
Perceived behavioral control	1.32	.082	0.97, 1.80	0.99	.953	0.71, 1.38	0.97	.827	0.72, 1.30
Social norm	1.03	.848	0.74, 1.44	0.87	.435	0.62, 1.22	1.01	.970	0.74, 1.36
Attitude	1.53	.033	1.04, 2.28	0.97	.879	0.64, 1.46	1.13	.504	0.80, 1.59
Pseudo-R <sup>2</sup>	.10			.01			.03		

Note. <sup>1</sup> 0 = 179 (non-users), 1 = 82; <sup>2</sup> only car owners included, 0 = 107 (non-users), 1 = 90; <sup>3</sup> only participants with driver's license included, 0 = 114 (non-users), 1 = 146; Nagelkerke Pseudo-R<sup>2</sup>

### **Intermediary Discussion**

The main research question of study 1 was to analyze if the Theory of Planned Behavior can be applied to different forms of shared car use behavior. While the attitude as well as the social norm towards shared car use was connected to the intention, perceived behavioral control showed no connection to the intention. This is unexpected, as perceived behavioral control is usually found as a significant factor of shared mobility (Bachmann et al., 2018; Si et al., 2020). Overall, the first study points out that the TPB-variables as we operationalized them are only partly connected to shared car use intention and behavior. Therefore, the TPB may not be the most adequate framework for explaining shared mobility as a collaborative PEB. Complementing the TPB-variables by solidarity-oriented variables may be purposeful. Furthermore, besides the focus on shared car use, the shared use of bicycles could be interesting, especially in urban contexts. Also, the results with view on the TPB-variables need statistical replication in a more diverse sample.

### **Method Study 2**

The goal of the second study was twofold: First, we aimed to replicate the results of study 1. Second, we investigated the incremental predictive value of solidarity-focused variables beyond TPB-variables (RQ2). The research questions as well as the study plan were preregistered at the Open Science Framework ([https://osf.io/aqsvz?view\\_only=d3bc42cb63d5497cad07d8b9943431c3](https://osf.io/aqsvz?view_only=d3bc42cb63d5497cad07d8b9943431c3)). A statement regarding deviations from the preregistration can be found in the according OSF-project ([https://osf.io/5d23m/?view\\_only=07ee5d0da13f40b78e7ed375976664cd](https://osf.io/5d23m/?view_only=07ee5d0da13f40b78e7ed375976664cd)).

### **Sampling Procedure**

Data was collected between January and July 2022 at the University of [blinded for review] as part of an interdisciplinary project with the focus on fostering shared mobility at the university. Members of the university were invited through official mailing lists, news on the university homepage as well as through a lecture class in macroeconomics where students were offered a small course credit when finishing the survey completely. We aimed to collect data from at least 500 participants from all status groups to ensure a minimum of representativity and to have a large enough sample to perform SEM (Wolf et al., 2013). The survey was part of a larger investigation including sections from other research disciplines. We included participants who completed all questions relevant for the present research questions. After removing participants who did not answer the quality check item correctly ( $n = 35$ ), the final sample size was  $N = 1411$ .

### **Participant Characteristics**

In this sample, 55.1 % of the participants were female, 42.9% were male, 0.7% diverse, and 1.1% did not specify their gender. The mean age was 27.6 years ( $SD = 10.61$ ). The majority of the participants were students (72.9%), followed by research and teaching staff (13.5%), and technical and administrative staff (12.8%). Around one half of participants lived not in the same city as the university (56.9 %), while the other half lived in [blinded for review] (43.0 %). A majority owned one car (35.5%) or two cars (28.8%) in their household. Some reported to own no car in their household (21.6%). The participant characteristics are summarized in more detail in Table 4).

Table 4.

*Sample Characteristics (Study 2)*

Categories	<i>n</i>	%
Gender		
Male	606	42.9
Female	778	55.1
Diverse	11	0.7
Not specified	16	1.1
Status at university		
Research and teaching staff	191	13.5
Technical and administrative staff	181	12.8
Students (also research assistants)	1028	72.9
Others (e.g. minijobber, visiting lecturer)	10	0.7
Not specified	1	0.1
Education		
No degree (yet)	5	0.4
Main school	6	0.4
Middle school	18	1.3
Higher education entrance qualification (Abitur)	862	61.1
University Degree	490	34.7
Other	28	2.0
Not specified	2	0.1
Income (Euro)		
under 500	132	9.4
500 to under 1000	242	17.2
1000 to under 1500	120	8.5
1500 to under 2000	92	6.5
2000 to under 2500	114	8.1
2500 to under 3000	90	6.4
3000 to under 3500	78	5.5
3500 to under 4000	68	4.8
4000 to under 4500	55	3.9
4500 to under 5000	60	4.3
5000 and more	137	9.7
Not specified	223	15.8
Occupation (only employed at university)		
Full-time employed	259	70.0
Part-time employed	113	30.4
Not specified / not occupied	1039	-
Number of cars in household		
0	305	21.6
1	501	35.5
2	407	28.8

3	137	9.7
4 and more	61	4.3
University is in same city than residence		
Yes	607	43.0
No	804	56.9

*Note.*  $N = 1411$ . Participants were on average 27.61 years old ( $SD = 10.61$ ). 9 participants did not specify their age. Percentages were rounded.

### Measures

In Study 2, in addition to shared mobility behavior and the variables of the TPB, the solidarity-oriented variables were measured on two conceptual levels. First, on a general level and second with a specific focus on the organizational context of the university and sustainable mobility.

#### *Shared mobility behavior*

In addition to the three shared mobility behaviors (Lending To, Renting From, Ridesharing) as presented in Study 1, we included bikesharing behavior (“How often do you use a bike-sharing service (e.g., Metropolraduhr)?”), which was rated on a 5-point scale (1 = *never* to 5 = *always*).

#### *Variables of the Theory of Planned Behavior*

As in Study 1, the TPB-variables (intention, social norm, perceived behavioral control, attitude) were formulated based on recommendations by Ajzen (2006). Each construct consisted of three items which were rated on a 5-point scale (1 = *not true* to 5 = *very true*). In contrast to Study 1 were the focus was on car use, the items were more generally formulated in order to include all kinds of shared mobility (e.g. for intention “In general, my goal is to frequently share means of transportation”).

### ***Social Identification***

Two types of social identification were collected. First, the general identification with other university members (“How much do you identify with the group of university members?”) was rated on a 5-point scale (1 = *not at all* to 5 = *very much*). Second, we wanted to assess the feeling of identification with a self-chosen group of the university, as university members may identify more strongly with smaller groups within the university context such as their research group or faculty. Participants selected this groups in a two-step process. As a first step, participants selected the organizational level they identified most strongly with (e.g., university, faculty) followed by selecting the status group at the university they identified most strongly with (e.g., students, administrative staff, researchers). In a second step, participants were asked to choose between the selected group on the organizational level (e.g., members of the faculty), the group on the status level (e.g., students), or a combination of both (e.g., students of the faculty). The combination option was only presented if the combination was reasonable. Based on the answer in step two, the feeling of identification with this self-chosen group was asked (“How much do you identify with the *\*self-chosen group\**?”). If participants chose in step one *or* two the option “none of the groups”, the respective other group option was presented in the following (e.g. students, if no group on the organizational level was chosen). Also, if they answered in step one *and* two with “none of the groups”, the value of the general identification was used for the specific identification variable.

### ***Social Responsibility***

General social responsibility was measured with a part of the German Short Schwartz’s Value Survey (SSVS-G; Boer, 2015). Each value was measured with one item that was rated on a 6-point scale (1 = *not important at all* to 6 = *very important*, Items: “Universalism: Understanding, appreciation, tolerance and protection of the well-being of all people and nature” and “Sociality: Maintaining and

improving the well-being of those with whom you have regular contact.”). Both dimensions are theoretically connected to solidarity-oriented values. While universalism includes nature and humanity, sociality focuses more on social support of close others. We analyzed them as separate factors in the models, as they constitute different dimensions in the SSVS-G.

Specific social responsibility was assessed using the subscale of social responsibility of the Personal Values des Youth civic and character measures toolkit consisting of four items (Syvertsen et al., 2015). They were formulated with regard to the self-chosen group from the specific social identification item (e.g., “It is important for me to think about how my actions will affect others of the \*self-chosen group\* in the future.”). The items were rated on a 5-point-scale (1 = *not true* to 5 = *very true*).

### ***Collective Response Efficacy***

To measure general and specific Collective Response Efficacy, items were formulated based on Hamann et al. (2021) and rated on a 5-point-scale (1 = *not true* to 5 = *very true*). General Collective Response Efficacy (e.g., “It is necessary to join with others to truly achieve something”) was measured using four items. Four items to measure specific Collective Response Efficacy were formulated with relation to the self-chosen group (see specific social identification) as agent and a more sustainable mobility with less emissions as aim outcome (e.g., “We as \*self-chosen group\* can contribute together to a more sustainable mobility”).

### ***Quality Check Item***

One instructed response item was integrated as attention check in one of the question blocks (“Please tick “fully agree” (quality check)”).

### **Data Analysis**

Descriptive statistics, intercorrelations and reliabilities of all psychological constructs are summarized in Table 5. As already in study 1, shared mobility behavior showed a strongly skewed

distribution and we therefore dichotomized the variables in same way as in Study 1. Furthermore, the Cronbach's alpha of the social norm was not acceptable ( $\alpha = .49$ ) and a confirmatory factor analysis showed negative variances. Therefore, in the following analyses we used only one item representing the social norm which showed the best distribution ("People who are important to me would support me if I used shared modes of transportation for my daily trips").

Regarding RQ1, the TPB-model from Study 1 was performed using SEM, with shared mobility intention as dependent variable and social norm, perceived behavioral control, and attitude as predictors. Complementarily, we conducted Logistic regression models with the TPB-variables as predictors and the self-reported shared mobility behavior as dependent variable.

To address RQ2, we calculated two extended TPB-models using SEM. In the first model, the TPB-model was extended by the general solidarity-focused variables (universalism, benevolence, general collective response efficacy, general social identification with members of the university). In the second model, the TPB-model was extended by the specific solidarity-focused variables (social responsibility, collective response efficacy, and social identification with the self-chosen identification group). In order to assess whether the solidarity-focused variables have a significant contribution beyond the TPB-variables in explained variance, both models were compared to the basic TPB-model using the *anova*-function (Fox & Weisberg, 2019).

We performed stepwise Logistic regression models with the dichotomized ridesharing behavior variable as dependent variable, which was the only behavior-variable that showed nearly similar group sizes. In the first step, the TPB-variables were included in the model as predictors. In a second step, the general solidarity-oriented variables were added. In a second model the specific solidarity-oriented variables were included.

Table 5.

*Means, standard deviations, and correlations (Study 2)*

Variable	<i>M</i>	<i>SD</i>	$\alpha$	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Intention	2.89	1.06	.85														
2. Perceived behavioral control	2.84	1.09	.88	.50**													
3. Social Norm	3.39	1.10	--	.39**	.33**												
4. Attitude	3.00	1.07	.75	.58**	.59**	.34**											
5. Universalism	5.17	0.88	--	.34**	.14**	.24**	.19**										
6. Benevolence	5.26	0.84	--	.22**	.12**	.25**	.16**	.50**									
7. Social responsibility specific	3.89	0.73	.81	.33**	.18**	.22**	.21**	.45**	.34**								
8. Collective Response efficacy	4.06	0.65	.79	.34**	.17**	.26**	.26**	.35**	.35**	.40**							
9. Specific Collective Response Efficacy	3.55	0.93	.91	.36**	.28**	.28**	.32**	.27**	.20**	.30**	.30**						
10. Social identification	3.05	1.00	--	.13**	.08**	.09**	.10**	.14**	.10**	.28**	.17**	.19**					
11. Specific Social identification	3.46	1.01	--	.07**	.04	.10**	.05*	.12**	.08**	.25**	.19**	.14**	.74**				
12. Ridesharing behavior	--	--	--	.28**	.10**	.12**	.18**	.08**	.11**	.06*	.10**	.10**	.00	-.05			
13. Lending to behavior ( <i>N</i> = 1106)	--	--	--	.18**	.04	.02	.11**	.08**	.08*	.06	.09**	.05	-.01	-.04	.11**		
14. Renting from behavior ( <i>N</i> = 1255)	--	--	--	.18**	.12**	.08**	.12**	.05	.05	.06*	.09**	.06*	.04	-.02	.13**	.32**	
15. Bikesharing behavior ( <i>N</i> = 1388)	--	--	--	.17**	.18**	.08**	.17**	.08**	.01	.09**	.11**	.11**	.20**	.15**	-.01	.06*	.18**

Note. *N* = 1411, \* indicates  $p < .05$ . \*\* indicates  $p < .01$ .

### Results Study 2

The TPB-SEM showed a mostly acceptable fit (CFI = .95, TLI = .92, RMSEA = .093, [CI .084; .104], SRMR = 0.52). As in study 1, social norm ( $\beta = .17, p < .001$ ) and attitude ( $\beta = .59, p < .001$ ) were positively related to shared mobility intention, while perceived behavioral control was not significant ( $\beta = .08, p = .121$ ). The explained variance in the intention was  $R^2 = .53$ . The model is depicted in Figure 2.

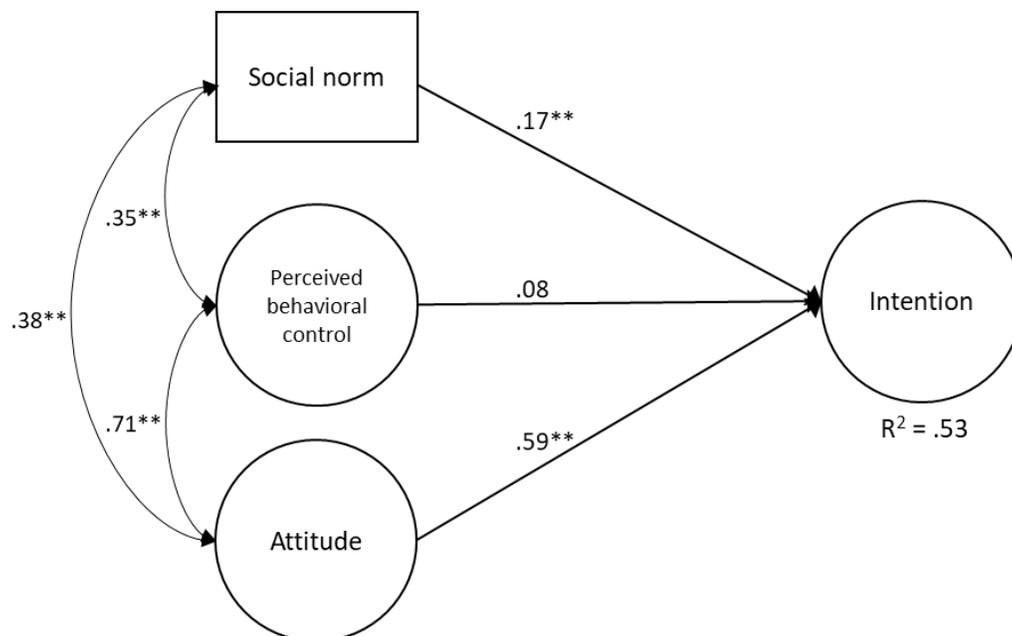


Figure 2: SEM with TPB-variables (Study 2)

The first extended TPB-SEM with the general solidarity-oriented variables showed a mostly good fit (CFI = .95, TLI = .93, RMSEA = .061, 90% CI [.056; .066], SRMR = .043). Of the solidarity-focused variables, universalism ( $\beta = .18, p < .001$ ) as well as general collective response efficacy ( $\beta = .12, p < .001$ ) positively predicted shared mobility intention. Benevolence ( $\beta = -.05, p = .085$ ) and the social identification with other university members ( $\beta = .03, p = .229$ ) were no significant predictors. In contrast to the non-extended TPB-SEM, perceived behavioral control was significant ( $\beta = .09, p = .042$ ). The model is summarized in Figure 3.

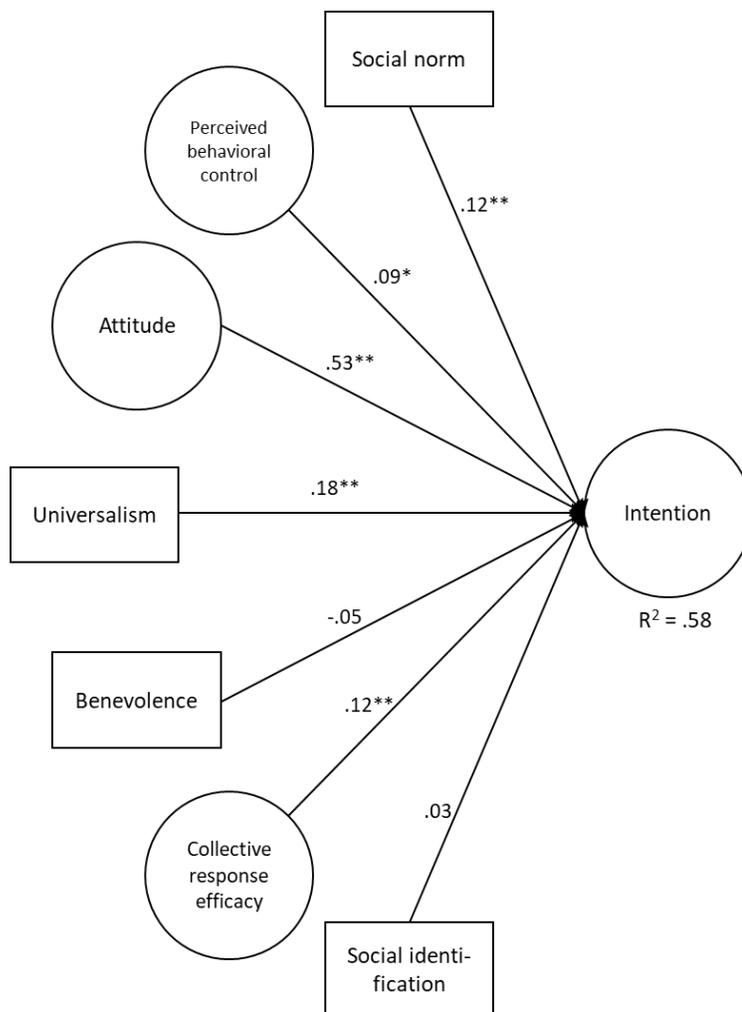


Figure 3: Extended TPB-SEM with general solidarity-oriented variables (Study 2)

The second extended TPB-SEM with the specific solidarity-oriented variables showed a good fit (CFI = .95, TLI = .95, RMSEA = .055, 90% CI [.050; .059], SRMR = .039). Specific social responsibility ( $\beta = .18, p < .001$ ) and specific collective response efficacy ( $\beta = .08, p = .005$ ) emerged as significant predictors of shared mobility intention. The social identification with the self-chosen group was no significant predictor ( $\beta = -.02, p = .297$ ). The model is depicted in Figure 4.

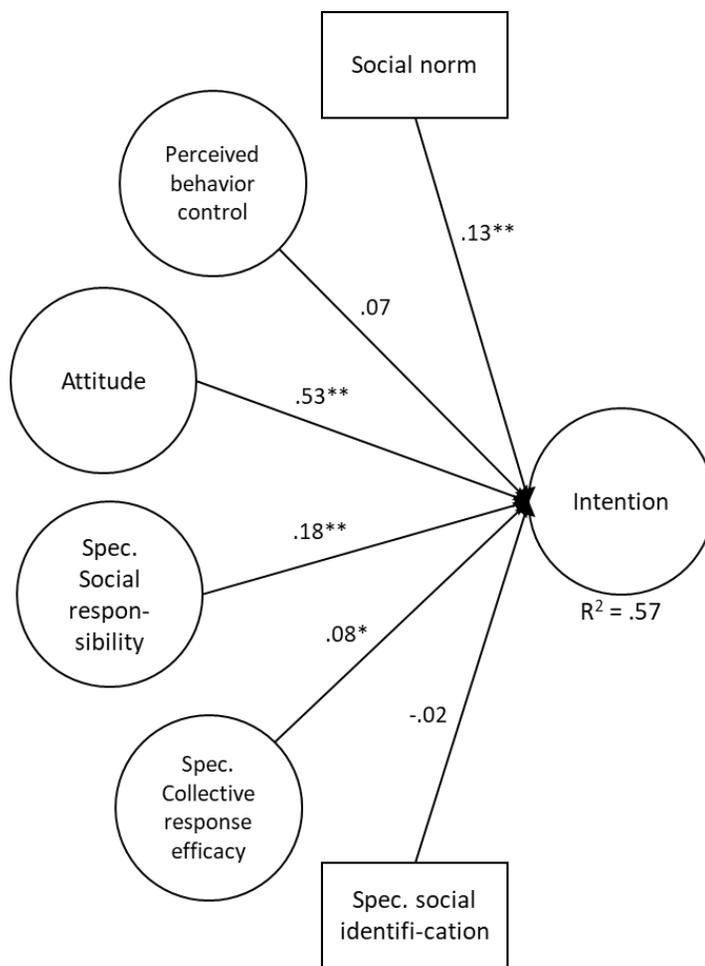


Figure 4: Extended TPB-SEM with specific solidarity-oriented variables (Study 2)

The stepwise logistic regression with ridesharing as dependent variable showed in the first step only one significant weak connection between perceived behavioral control and ridesharing behavior in a negative direction (OR = 0.86,  $p = .023$ ). In the second step with inclusion of the general solidarity-oriented variables, benevolence was a significant positive predictor (OR = 1.22,  $p = .011$ ). In the model which included the specific solidarity-oriented variables, the social identity with the self-chosen group was a significant, weak negative predictor (OR = 0.86,  $p = .011$ ) (see Table 6).

Table 6.

*Logistic regression with Ridesharing as dependent variable and solidarity-oriented variables as predictors*

	TPB-variables			General solidarity-oriented variables			Specific solidarity-oriented variables			
	OR	Step 1 P	CI	OR	Step 2 p	CI 95%				
Intention	1.73	<.001	1.51, 1.98	1.76	<.001	1.53, 2.04				
Perceived behavioral control	0.86	.023	0.75, 0.98	0.86	.022	0.75, 0.98				
Social norm	1.03	.629	0.92, 1.15	1.01	.820	0.90, 1.13				
Attitude	1.14	.060	0.99, 1.31	1.14	.067	0.99, 1.31				
Pseudo-R <sup>2</sup>	.11									
Universalism				0.89	.077	0.76, 1.03				
Benevolence				1.22	.011	1.05, 1.43	Social responsibility	0.94	.462	0.76, 1.03
Collective response efficacy				1.00	.976	0.83, 1.22	Specific collective response efficacy	1.04	.553	1.05, 1.43
Social identification				0.92	.161	0.82, 1.03	Specific social identification	0.86	.011	0.77, 0.97
Pseudo-R <sup>2</sup>				.11			.11			

*Note.* Nagelkerke Pseudo-R<sup>2</sup>, Model with general solidarity-oriented variables: N = 1411, 0 = 649 (non-users), 1 = 762;; Model with specific solidarity-oriented variables: N = 1411, 0 = 649 (non-users), 1 = 762.

## General Discussion

### The Theory of Planned Behavior and its limits to explain collaborative behaviors

The present paper investigated psychological predictors of shared mobility intention and behavior using predictors of the TPB and solidarity-oriented variables. The test of the TPB-variables as predictors of shared mobility intention (RQ1) yielded a similar pattern in both samples. While social norms and attitude were consistently and significantly connected to shared mobility intention, perceived behavioral control was not, indicating the perceived integrability of shared mobility in everyday mobility to be no relevant factor. This stands in contrast to previous studies that found perceived behavioral control to be a predictor of shared mobility (e.g. Bachmann et al., 2018; Si et al., 2020). Post-hoc interpretation of this result may be first that the use of shared mobility in everyday mobility is not perceived as a concrete behavioral option. However, the bivariate correlation between Attitude and perceived behavioral control was at the same time high, which might point out to discriminatory validity problems. Second, we summarized a wide range of shared mobility behaviors in the TPB-constructs which may be not behavior-specific enough, especially with regard to the perceived behavioral control which has an explicit focus on behavior. For example, different evaluations of perceived behavioral control of ridesharing compared to bikesharing are likely. A more specific operationalization of those constructs aligned with the specific behaviors could be more purposeful.

Regarding self-reported shared mobility behavior, results of the present study show that the psychological variables are mostly no significant predictors and contribute overall very little to the explanation of behavior. The weak correlations between the psychological constructs, especially intention and behavior confirm this impression. One explanation might be that mobility behavior depends strongly on infrastructure such as the availability of carsharing stations. The gap between

intention and behavior may therefore be an expression of missing behavioral possibilities or the missing perception of them.

### **The role of (contextualized) solidarity-oriented variables**

Furthermore, we investigated if the solidarity-oriented variables are connected to shared mobility intention and if they explain variance in shared mobility beyond to the TPB-variables (RQ2). Thereby the solidarity-oriented variables were investigated on a general and on a contextualized level. Results show that on a general level, universalism and general collective response efficacy were connected to shared mobility intention, while benevolence and social identification with other members of the university were no relevant factors. This indicates that individuals who highly value the well-being of all people and nature are more likely to intend to use shared mobility options, while the welfare of those with whom one is in frequent personal contact (benevolence) seems to play a less important role. This is theoretically consistent because universalism includes environmental protection and implicates a more biospheric worldview that includes all beings and is connected to pro-environmental behavior intentions (e.g. Groot & Steg, 2010). Regarding the analyses of self-reported ridesharing behavior, benevolence was weakly, but significantly connected to this behavior. Thus, the role of universalism and benevolence may differ between intentions and self-reported behavior.

Further results showed that individuals who believe that collaborating with others is purposeful to reach goals in general are more likely to intend to use shared mobility options. Although this relationship is rather weak, it confirms our assumption that collective efficacy beliefs may be a relevant factor for (collaborative) PEB (Hunecke, 2022b). Social identification with all members of the university was not related to the shared mobility intention, indicating that the social identification on this general level plays no role for the intention to use shared mobility options.

The analyses on the specific level showed specific social responsibility and specific collective response efficacy to be connected to shared mobility intention. Both effects show that individuals who feel socially responsible and efficacious with regard to their self-chosen social group at the university are more likely to intend to prefer shared mobility options. Social identification with the self-chosen group on its own - when not combined with constructs such as collective efficacy and social responsibility - showed no connection to shared mobility intention. Regarding ridesharing behavior, there was even a small negative effect of the specific social identification. This contradicts studies that found social identities to be connected to PEBs, even when the group has no environmental focus (Vesely et al., 2021). One reason for the missing link between social identification and shared mobility may be that the pro-environmental context was missing in the operationalization of social identification. For future studies investigating the role of social identification for shared mobility as a type of PEB, we suggest differentiating between groups that offer an overall organization identification vs. identification with smaller subgroups within the organization and strong/weak relation to pro-environmental topics (e.g. environmentalists vs. groups with no pro-environmental focus). Also exploring the potential of opinion-based groups (McGarty et al., 2009) (e.g. identification with people supporting sustainable mobility initiatives) could be interesting in the context of shared mobility. Furthermore, when investigating efficacy beliefs in the group context, participate efficacy, which is one's belief in contributing to the goal of the group could be a promising factor (Bamberg et al., 2015).

When comparing the results on solidarity-oriented variables on the general and contextualized level, the following central conclusions can be drawn. First, the value of social responsibility towards nature and humans as well as the belief in the effectiveness of collaboration with others are important for shared mobility intention, even when controlling for TPB-variables. This confirms our suggestions that social interaction variables can meaningfully extend the private-sphere focused TPB and supports earlier evidence that prosocial motives play an important role in PEB. The solidarity-oriented variables also

contributed significantly to the explained variance in shared mobility intention in both models, indicating an independent albeit small contribution. However, it should be further be noted that the effect sizes of the connections are overall weak.

### **Limitations and future studies**

The first limitation is that the results need further statistical and conceptual replication. Especially the results of Study 2 are preliminary, because the connections were tested only in one sample. Also, we focused on the context of universities by collecting data at two locations and different points in time. Data for Study 2 were collected in 2022 after several COVID-19 lockdowns in Germany. Many members of the university were not commuting to the university as usual and therefore it is questionable whether the results are conclusive for post-pandemic times. Furthermore, the present results are based on data from a Western, Educated, Industrialized, Rich, and Democratic (WEIRD) population, which is legitimate, as this group emits the most greenhouse gases in a global comparison. Still, the transferability to other cultures is extremely limited (Henrich et al., 2010), especially in sharing behaviors where socio-cultural influences are likely (Say et al., 2021).

Future studies should stronger focus on pro-environmental motives of shared mobility, as the potential of confounding motives such as financial benefits is high (Hunecke et al., 2021; Standing et al., 2019). Also, we measured behavior only with self-reports and only crosssectionally, which is not exact and can lead to validity problems (Kormos & Gifford, 2014; Lange et al., 2023). We faced a highly skewed distribution of shared mobility behaviors as most participants reported only little or no experience at all using shared mobility. This restriction in observed variance further limited our analyses. To get more valid insights into psychological factors of uncommon behaviors, the focus on a sample of individuals already using shared mobility in their everyday mobility may be more promising (e.g. Julsrud & Priya Uteng, 2021). It should furthermore be noted that the analysis of structural models based on cross-

sectional data does neither allow causal conclusions nor conclusions about intraindividual processes (Molenaar, 2004).

In general, infrastructural conditions strongly influence mobility behavior, which is why psychological factors may only play a minor role in explaining shared mobility. Instead of focusing on individual decision making, it would be important to also research conditions that support collaborative behaviors such as shared mobility. For example, it might be a promising path to explore individuals' motivation to join collective efforts pushing for sustainable mobility transitions including shared mobility on a political level.

### **Implications for Mobility-specific Measures to foster shared mobility at universities and other organizations**

Based on insights of the present study we suggest policy-instruments for universities and other organizations that should be established to make shared mobility behavior easier.

#### ***Communication: Providing information fort shared mobility***

To support a positive attitude toward shared mobility, the organization can focus on communicating different advantages of shared mobility options. Financial benefits of shared mobility behaviors should be transparently communicated, as they are a connected to shared mobility (Hunecke et al., 2021) and costs of individual car mobility are often underestimated (Burlando et al., 2019). Furthermore, enjoying trips with others as well as time savings e.g. through carpooling can be motivating and could be communicated as advantage (Julagasigorn et al., 2021; Li et al., 2007).

Despite the missing connection of perceived behavioral control as we measured it with shared mobility, we suggest that organizations aiming to foster shared mobility, should take efforts to support their members in making behavioral plans and help to foster implementation intentions (Bamberg,

2013; Gollwitzer & Sheeran, 2006), for example through providing (online)platforms that support the organization of journeys with others.

Taking social responsibility can influence not only the actions of individuals but also of organizations. Corporate Social Responsibility (CSR) refers to the impact of the organization on society (Carroll, 1999) and thus also to the social and environmental consequences of the mobility behavior of its members. From our results, it can be recommended that CSR measures focused on shared mobility should emphasize their communication on general socio-ecological values (universalism), and not on social identification with the organization, regardless of which organizational group the identification refers to. Furthermore, collective efficacy beliefs should be strengthened above all by communicating the successes of individual organizational members. At the collective level of the organization, feedback can be given through communicating successes for example through individual travel routes that have been replaced by shared mobility or the amount of greenhouse gas emissions saved. Moreover, the social norm regarding shared mobility should be strengthened within the organization by communicating shared mobility as a desirable behavior in the organization and actively supporting it through measures.

### ***Structural changes needed for shared mobility***

Shared mobility is one key element of a sustainable mobility transformation and therefore shared mobility behaviors should be performed more frequently. However, up to now, shared mobility behavior is rather uncommon and our study has confirmed this tendency in a university context. At the same time, psychological factors seem not to contribute much in order to explain shared mobility behaviors. This indicates that not psychological factors, but situational and structural conditions of mobility behavior do strongly influence if people use shared mobility options. Therefore, to overcome

unfavorable conditions, structural changes can help to make shared mobility behavior easier for individuals.

In our view, establishing local mobility cooperatives (e.g. at universities) could effectively facilitate these aggravated conditions by providing individuals an easy access to sustainable mobility options. Mobility cooperatives have the potential to organize mobility oriented towards the needs of its members by offering Mobility as a Service (MAAS, Becker et al., 2018). Thereby, the cooperative owns a vehicle fleet or provides mobility services which are available to its members, thereby potentially partly avoiding the demand of private cars (Giesel & Nobis, 2016; Kolleck, 2021). For individuals, being part of a cooperative is connected to several benefits such as financial advantages, a professional handling of transactions as well as participation of the members in cooperative-decisions.

Cooperatives are a solidarity-oriented organizational form comprising the collaboration with others. Especially, they might have a potential to support the belief in having a meaningful ecological impact through being part of the cooperative (collective response efficacy), if the cooperative is successful.

### **Additional Information**

#### **Ethic statement**

Study 1: At the time these studies were conducted, our faculty had no Internal Review Board to grant ethical approval. However, we certify that the research adhered to the ethical principles of the American Psychological Association (APA, 2010). Informed consent was attained by asking participants to continue only if they were willing to participate and if they had read and understood the instructions and information provided. Participants were told that participation was voluntary and that they had the right to withdraw from the study at any time. Participants were informed about the goals of the study. The data were anonymized and treated confidentially.

Study 2: This research was approved by the Research Ethics Board at [*blinded for review*]. All subjects gave written informed consent in accordance with the Declaration of Helsinki (2013).

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