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Understanding car-sharing by integrating long-, medium- and short-term cognitions

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ABSTRACT

Examinations into the psychological drivers of car-sharing have to date focused on short-term cognitions such as attitudes, norms, and intentions. In this paper, we integrate such short-term cognitions with medium-term cognitions (e.g., goals) and long-term cognitions (e.g., values), thereby providing a more comprehensive understanding of the psychological drivers of car-sharing. We surveyed a broadly representative sample of the UK population (N = 1,294) and found that values underlie medium-term cognitions (e.g., goals) and short-term cognitions, thereby ultimately influencing car-sharing intentions and behaviour. Moreover, our results show that environmental consciousness and the desire for luxury are important yet opposing goals that affect both intentions to engage in car-sharing and to actually use car-sharing. Overall, we demonstrate that car-sharing may be more complex than previously anticipated and should be understood as a behaviour that results from a complex web of long-, medium-, and short-term cognitions. We discuss practical and theoretical implications.

1. Introduction

The transportation sector significantly contributes to anthropogenic climate change, accounting for 15 % of the total energy-related CO2 emissions in 2019 (Shukla et al., 2022). Since 1970, emissions directly tied to transportation have increased by 250 % globally, surpassing the growth rate of any other energy-consuming sector (Mattioli et al., 2020). Road transport is the primary contributor to these emissions (European Environment Agency, 2016). Within and between countries, diverse conditions show that transportation in general and car usage in particular have different degrees of significance in relation to how essential they have become in supporting human well-being Especially in developed countries, car ownership and use have become prerequisites for social inclusion, particularly in suburban and *peri*-urban areas designed around the presumption of nearly universal car access (Mattioli and Stanley, 2017).

To address these challenges, shared mobility has been proposed to be part of the solution. Since car-sharing would act to reduce both private car ownership and vehicle kilometres travelled (VKT), it has been promoted as a sustainable alternative to owning cars. We define car-sharing as the sharing of cars in the possession of service providers in exchange for a fee. By acting to reduce car ownership, it also encourages the use of sustainable transport modes like public transit, walking, and cycling (Kent, 2020). For example, studies show that car-sharing members own fewer cars, leading to a decrease in VKT, although the impact on VKT may vary due to factors like changing travel habits (Kent, 2020).

Due to its potential to address urban mobility challenges, it is unsurprising that research into the drivers of car-sharing has been

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proliferating. Research focus has been heavily skewed towards understanding the demographic determinants. For example, currently, car-sharers are typically well-educated, young adults aged between 25 and 45 (Vine et al., 2014), often residing in carless or single-car households, and frequently utilizing public and active transport modes (Rabbitt and Ghosh, 2016). Although such insights are valuable, researchers have only recently begun to engage with understanding the psychological factors influencing individual engagement with car-sharing (Alonso-González et al., 2021). Indeed, existing research has so far focused only on specific short-term cognition such as attitudes (Acheampong and Siiba, 2020), social norms (Mundaca et al., 2022), expectations (Curtale et al., 2021) and others (Jain et al., 2021; Thurner et al., 2022). What is missing is a more comprehensive understanding of how different types of cognition interact to affect car-sharing behaviour. We define short-, medium-, and long-term cognitions along a continuum of abstraction ranging from low to high, respectively. More precisely, how do short-term cognitions interact with both medium-term cognitions such as personal goals and long-term cognitions such as values to jointly influence both intentions to engage in car-sharing as well as actual car-sharing behaviour.

In this paper, we integrate short-term cognitions such as those put forward by the Theory of Planned Behaviour (TPB; Ajzen, 1991) with medium and long-term cognitions such as goals and values, respectively. Instead of treating them as isolated entities, we demonstrate that car-sharing may be best understood through these sets of proximal factors, thereby creating a more comprehensive understanding of car-sharing. In other words, our aim with this paper is to demonstrate the cognitive complexities that give rise to car-sharing behaviours. We do so by basing our framework loosely on the work of Paulssen et al. (2014) and integrating it with psychological literature. Indeed, our conceptualisation of car-sharing will not only enhance our understanding of the cognitive processes underpinning car-sharing behaviour, but it will also generate important insights for practitioners in how to influence the adoption of car-sharing, as we will outline at the end of the paper.

2. Literature review

2.1. Theory of planned behaviour

The Theory of Planned Behaviour (TPB) is one of the most frequently applied frameworks to understand individual behaviours (Ajzen, 2011). It centres on short-term cognitive functions, honing in on intentions, attitudes, subjective norms, and perceived behavioural control (Ajzen, 1991). We define TPB-related constructs as short-term cognitive functions because they are the less abstract, compared to goals and values (see below). TPB has proven valuable in elucidating travel choices through both qualitative and quantitative studies (Lanzini and Khan, 2017). For example, car attitudes have been shown to be positively associated with car use (Kroesen, 2014; Kroesen et al., 2017; Olde Kalter et al., 2020). Moreover, research has shown that subjective norms are positively associated with intentions to use public transport (Donald et al., 2014). Finally, perceived behavioural control (PBC), the ease individuals feel when engaging in specific behaviours, has been shown to be positively related to intentions to perform that behaviour (Haustein and Hunecke, 2007; Eriksson and Forward, 2011; Jain et al., 2021). Aligned with these established effects, we hypothesise:

H_1: Short-term cognitive functions (attitudes, PBC, and subjective norms related to car-sharing) will be positively related to car-sharing intentions.

H_2: Car-sharing intentions will be positively associated with car-sharing behaviour.

Although these hypotheses are intuitive and aligned with TPB, scholars have repeatedly demonstrated limitations within the TPB framework. For example, van Wee et al., (2019) argue for a reverse causality of behaviour and attitudes, essentially proposing that behaviour shapes attitudes. Other scholars have criticised TPB based on the few constructs it contains (see Godin et al., 2005). Therefore, TPB is often used as a base framework which is then integrated with other constructs. Given the strong evidence in the environmental psychological literature on the positive effects of long-term cognitions such as values (Schwartz, 1992) and medium-term cognitions such as goals (Austin and Vancouver, 1996), we aim to integrate the short-term cognitive effects proposed within the TPB framework with these long and medium-term cognitive effects to build a more comprehensive understanding of car-sharing.

2.2. Goals

Defined as "internal representations of desired states, where states are broadly construed as outcomes, events, or processes" (Austin and Vancouver, 1996, p. 338), goals encompass cognitive processes to achieve such desired end-states (Osbaldiston and Sheldon, 2003). They can vary in abstractness, ranging from very low levels for micro tasks such as preparing food to very high levels which represent long-term goals such as values (Austin and Vancouver, 1996). Therefore, while goals can also be less abstract, and thus serving short-term cognitive functions, we focus our efforts and more general and abstract goals. To learn more about concrete (less abstract) and abstract goals, we refer the reader to the works of Emmons (1992), Freitas et al. (2001), and Latham (2011). Accordingly, we define goals as medium-term cognitions because, in our case, they are more abstract than short-term cognitions such as TPB-related constructs. Environmental psychological research has unequivocally demonstrated the importance of both low and high-level abstract goals on environmental behaviours (for reviews, see Steg et al., 2016). For example, goals are crucial in predicting food waste behaviours (Bretter et al., 2022) and recycling (Wesley Schultz et al., 1995). To the best of our knowledge, examinations of personal goals within the realm of transportation studies have been scarce. Indeed, we did not find any scholarly investigations into goals and car-sharing. Hence, we follow Bretter et al., (2022) and aim to conduct an exploratory investigation using a wide range of different goals that have been shown to be relevant in past psychological research for various environmental behaviours. Therefore, we integrate past environmental psychological research on goals and identify the most relevant goals to affect car-sharing. Accordingly, we cannot state exact *a priori* hypotheses, but can only hypothesise in line with previous environmental psychological research. Moreover, based on the

work conducted by Paulssen et al. (2014), who found that longer-term cognitions precede short-term cognitions such as attitudes, we can hypothesise:

H_3: Medium-term cognitive functions (goals related to car-sharing) will be associated with car-sharing intentions.

H_4: Medium-term cognitive functions (goals related to car sharing) will be associated with actual car-sharing behavior.

2.3. Values

Values are defined as deep-rooted belief structures acting as guidance principles for individuals when selecting behaviour or evaluating information (Schwartz, 1992; Schwartz, 2007; De Groot & Steg, 2007). Values thus play a fundamental role in shaping general individual behaviour (Sagiv et al., 2017) as well as environmental behaviour (Clayton et al., 2015; Osberg et al., 2024; Stern et al., 1999). Although values can be considered as goals, depending on their level of abstraction, "not all values are goals" (Sagiv et al., 2017, p. 1). For our purposes, values are considered more general and abstract whereas goals are slightly more specific and less abstract. Acknowledging that conceptualisations of values vary (Stern et al., 1999), the most relevant for our purposes due to an inherent environmental focus comes from De Groot and Steg (2007, 2008). In their view, three value-orientations exist: egoistic, altruistic, and biospheric. While egoistic values can be defined as deep-rooted beliefs relating to wealth and power, altruistic values are beliefs in favour of social justice, equality, and peace (De Groot & Steg, 2007, 2008). Biospheric values, lastly, are beliefs about the importance of nature and the need to protect the environment (De Groot & Steg, 2007, 2008). Given that individuals high on the altruistic and biospheric value-orientation tend to care strongly for others or, respectively, the environment, it is perhaps not a surprise that those two value-orientations have received most attention in environmental psychology. For example, altruistic values are associated with various environmental behaviours such as green energy purchasing (Hartmann et al., 2017) or recycling (Evans et al., 2013). Similarly, individuals with strong biospheric values have been shown to save more energy (Bouman et al., 2020), be more energy efficient and consume less meat (Van der Werff et al., 2013). Similarly, one may speculate that both biospheric and altruistic values are positively associated with intentions to use car-sharing. Likewise, it may be that egoistic values are negatively associated with car-sharing intentions.

Although the importance of long-term cognitive functions such as values for environmental behaviours has been demonstrated, little research has been conducted in the field of transport. In one of the few studies, Coogan et al., (2007) showed that values are associated with walking frequency, although they did not clearly define values. Similarly, Nordfjærn and Rundmo (2019) showed that values had an indirect effect on driving intentions. Indeed, Jakovcevic and Steg (2013) also found that altruistic values were positively associated with intentions to reduce car use. However, how values may or may not relate to car-sharing and how they interact with the medium-term cognitions of goals and with short-term cognitions such as attitudes has not been properly understood. Yet, Paulssen et al. (2014) demonstrated that, for transport behaviour, longer-term cognitions are to be understood as antecedents of short-term cognitions such as attitudes. Given that values are usually understood as long-term cognition and as stable over time (Schwartz, 1994), scholars conceptualise values as antecedents of both short-term cognitive functions such as attitudes and medium-term cognitions such as goals. In other words, both medium-term and short-term cognitions are thought to mediate the effects of values (Steg

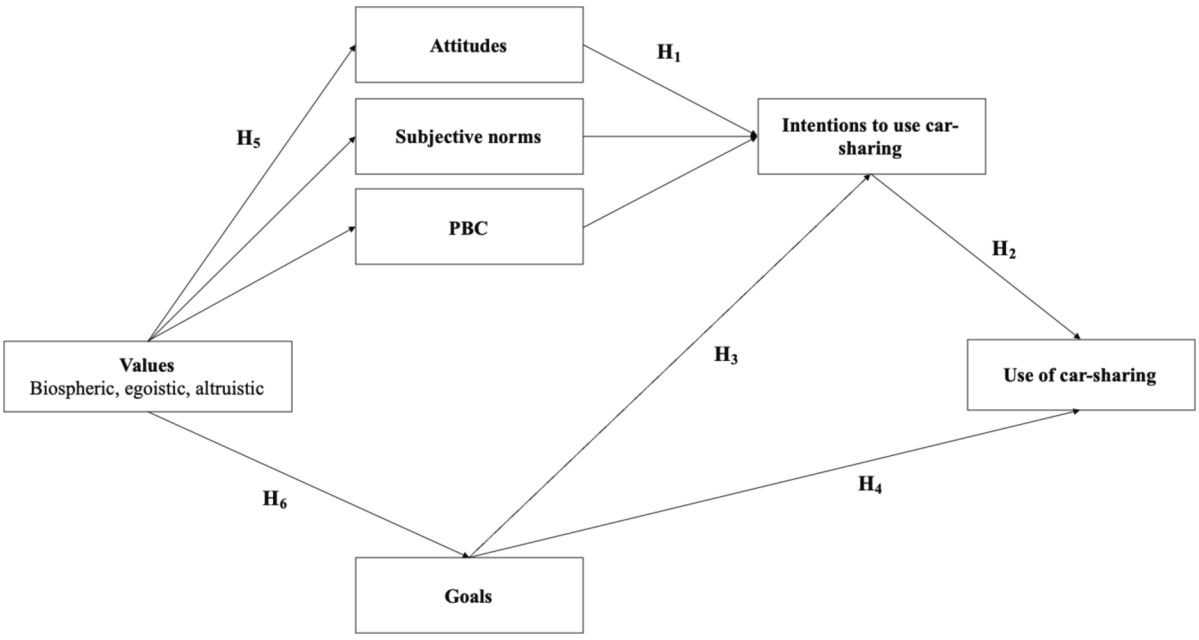

Fig. 1. Conceptual model and hypotheses, including long-term functions (values), medium-term functions (goals) and short-term functions (Attitudes, Subjective social norms, PBC).

et al., 2014; Roos and Hahn, 2017). This is aligned with transport research that has shown values as antecedents of short-term cognitive functions such as those proposed by TPB (Paulssen et al., 2014; Arroyo et al., 2020). Accordingly, we hypothesise:

H_5: Long-term cognitive functions (egoistic, biospheric, and altruistic values) will be associated with short-term cognitive functions (attitudes, PBC, and subjective norms related to car-sharing).

H_6: Long-term cognitive functions (egoistic, biospheric, and altruistic values) will be associated with medium-term cognitive functions (goals related to car-sharing).

Our conceptual framework is illustrated in Fig. 1. Note that, although the conceptual model is causal is nature, the current study investigates only the individual relations between these constructs. This is because the constructs in the conceptual model have not been tested in the context of car-sharing behaviour.

3. Methods

3.1. Study objectives

The objective of our study is to test the associations within the conceptual model (Fig. 1). In other words, we are testing the associations between long-term cognitive functions (values) and medium-term cognitive functions (goals) and short-term cognitive functions (attitudes, subjective norms, PBC); and between short-term and long-term cognitive functions and car-sharing intentions and behaviours.

3.2. Participants and procedure

We conducted the survey using Prolific, a common practice in psychological research (Bretter et al., 2023). Prolific is a panel provider frequently used to conduct online research (Peer et al., 2017). If interested in contributing to research, individuals need to sign up to Prolific and get invited to participate in surveys, if they meet the minimum requirements set by researchers. This survey examined people's preferences to engage in car sharing and their underlying motivations and participants were paid in line with Prolific's ethical guidelines. At the beginning of the survey, we presented participants with our aforementioned definition of car-sharing. Then we measured participants' values, followed by our goal items and TPB-related constructs. Aligned with previous research (Bretter et al., 2022), we aimed for a relatively large sample size and collected data from 1,294 participants. Importantly, all of our participants were employed at the time of the survey, had a UK driving licence, and were frequent drivers (>1 h per week). On average, the survey took 7.5 min to complete.

As can be seen in Table 1, our sample's gender distribution and average age closely aligns with that of the UK, suggesting that our sample is representative of gender and age. However, our sample shows slight discrepancies in distribution of ethnicity, compared to the UK's distribution. Individuals self-identifying as Asian or Asian British are underrepresented while people self-identifying as "White" were overrepresented. Overall, while some discrepancies exist, our sample appears to be *broadly* representative of the UK population.

Table 1
Demographic information of our survey participants and a comparison with the UK population.

Demographic information	*Study (N = 1294)*	*UK population*
Gender		
Female	48.5 %	51.0 %
Male	51.4 %	49.0 %
Other/ prefer not to say	0.2 %	–
Ethnicity		
White	91.0 %	81.7 %
Mixed	1.8 %	2.9 %
Asian	4.4 %	9.3 %
Black	2.2 %	4.0 %
Other/ Prefer not to say	0.6 %	2.1 %
Education		
National Vocation Qualification	12.2 %	–
GCSE or similar	9.7 %	–
A-Level	14.1 %	–
Undergraduate degree	43.8 %	–
Postgraduate degree	18.2 %	–
PhD	2.0 %	–
Age	$M = 40.38$ ($SD = 11.35$)	40.1 years
Annual Gross Income (in £000)	$M = 36.31$ ($SD = 19.88$)	–

Note. M = mean, SD = standard deviation.

Table 2
Constructs, items, scales, and sources.

Construct	Item	Scale	Source
Egoistic values	Social Power: Control over others; dominance Wealth: Material possessions; money Authority: The right to lead or command Influential: Having an impact on people and events Ambitious: Hard-working; aspiring	(1) = "Not at all important to me"…(7) = "Very important to me"	De Groot and Steg (2007)
Altruistic values	Equality: Equal opportunity for all A world at peace: Free of war and conflict Social Justice: Correcting injustice; care for the weak Helpful: Working for the welfare of others	(1) = "Not at all important to me"…(7) = "Very important to me"	De Groot and Steg (2007)
Biospheric values	Preventing pollution: Protecting natural resources Respecting the earth: Harmony with other species Unity with nature: Fitting into nature Preserving nature	(1) = "Not at all important to me"…(7) = "Very important to me"	De Groot and Steg (2007)
Goals	Spending as much time as possible outside of the car. Having the highest quality car. Having a great experience when driving a car. Having a spacious car. Having luxurious car. Being in short distance from where the car is parked. Having a clean car. Doing something good for the environment. Not being stuck in traffic. Being frugal and thrifty. Protecting the environment Ensuring social justice by not using more resources than I need. Not standing out from the crowd. Being a good citizen or neighbour. Having access to a large variety of cars. Having a car available for emergencies. Having a car as a status symbol.	(1) = "Not at all important"…(5) = "Very important"	Adapted from Bretter et al. (2022)
Car attitudes	"I think cars are…" "I think cars are…" "I think cars are…" "I think cars are …"	(1) = "Very bad"…(5) = "Very good" (1) = "Very harmful"…(5) = "Very beneficial" (1) = "Very unpleasant"…(5) = "Very pleasant" (1) = "Very unsatisfying"…(5) = "Very satisfying"	Adapted from Bretter et al. (2022)
Subjective Norms	If I used car sharing more often, people who are important to me would… Most people who are important to me think that sharing cars is…	(1) = "Completely disapprove"…(5) = "Completely Approve" (1) = "Very undesirable"…(5) = "Very desirable"	Adapted from Bretter et al. (2022)
Behavioural Control	How much control do you have over whether you use car sharing services? How difficult would it be for you to use car sharing services? It is mostly up to me whether or not to use car sharing services.	(1) = "Very little control"…(5) = "Very much control" (1) = "Very difficult"…(5) = "Very easy" (1) = "Strongly disagree"…(5) = "Strongly agree"	Adapted from Bretter et al. (2022)
Intentions to use car-sharing	I try to use car sharing services. I intend to use car sharing services. I plan to use car sharing services.	(1) = "Strongly disagree"…(5) = "Strongly Agree"	Adapted from Bretter et al. (2022)
Car Share Frequency	How many times do you use (or have you used) car sharing services.	(1) = "Not at all"…(7) = "More than twice per Week"	Adapted from Bretter et al. (2022)

3.3. Measures

The questionnaire included measures of all constructs in the conceptual model. Table 2 presents all constructs, items, rating scales, and sources. Briefly, all but one construct (car-sharing behaviour) had at least two items and all items were rated using either a 7-point or 5-point scale. The three value measures (egoistic, altruistic, and biospheric) were used as they were originally intended. Attitudes, subjective social norms, and perceived behavioural control items were adapted from Bretter et al. (2022) to cars and car-sharing by changing the topics of the items, such as "I think cars are…" and "If I used car-sharing more often…". As in Bretter et al. (2022), the Goals items were selected from a wide range of goals shown to be important for various environmental behaviours and adapted to a car-driving context. For example, participants were asked how important it was to have a great experience when driving a car. The Goals items were further analysed to identify the factors (goals) that may underlie car-sharing decisions (see section 4.1). Finally, car-sharing intention was measured by items asking whether they intended to use car-sharing services, and car-sharing behaviour was measured using a single question asking how many times they have used car-sharing services.

3.4. Data analysis

In the first step of our data analysis, our sample was randomly split in two to extract underlying factor structures for our goal measures. With half of the sample, we conducted the exploratory factor analysis (EFA; $n_1 = 633$), while with the second half, we conducted the confirmatory factor analysis (CFA; $n_2 = 661$). In the second step, we integrated the extracted goal constructs into our full dataset and conducted Structural Equation Modelling (SEM) to test our hypotheses. While we acknowledge that an examination of bivariate correlations may allow us to test our hypotheses, we opted for SEM that, although using correlations, would lead to less biased results because it accounts for the measurement error of our latent variables (Thakkar, 2020). To be clear, however, the objective of our analysis was to test the associations within the model, and not the overall causal model (i.e., not the overall indirect effects). The analysis utilized SPSS version 29.0.1.0 for EFA and RStudio Version 4.2.2 for CFA and SEM.

4. Results

4.1. Goals

We conducted the EFA with all 17 goal items for one half of our overall sample. Extraction was based on Eigenvalues > 1 and on varimax rotation. Although the preliminary results of the EFA revealed a four-factor structure, we needed to remove several items due to cross-loadings. We report this in the Supplemental Materials. Table 3 shows the final factor structure resulting of the EFA.

Our analysis revealed a two-factor structure, each comprising four goals. The first factor labelled 'luxury' is warranted based on the interconnectedness and thematic consistency observed among the provided goals. The goals presented—such as "Having the highest quality car,", "Having access to a large variety of cars", "Having a car as a status symbol" and notably, "Having a luxurious car"—emphasize a collective aspiration for opulence, comfort, and sophistication in the realm of automobile ownership and usage.

The four goals underlying the second factor converge around the theme of "Environmental Consciousness." Goals such as "doing something good for the environment", and "Ensuring social justice by not using more resources than I need" show that environmental protection and justice are intertwined.

To examine whether both of our goal factors show sufficient divergent validity and reliability, we conducted a CFA with the second half of the sample. The results are presented in Table 4. Importantly, the measurement model had acceptable fit indices ($\chi^2 = 26.65$; $df = 19$; $p = 0.072$; $RMSEA = 0.028$; $SRMR = 0.026$; $CFI = 0.99$; $TLI = 0.99$). All of our items loaded moderately to strongly on their assigned factor ($\beta > 0.50$). Moreover, both latent constructs showed sufficient reliability ($\alpha > 0.78$) and met the threshold set by Fornell and Larcker, (1981) for divergent validity, that is, an average variance extracted (AVE) of greater than 0.50. Therefore, we extracted two medium-term cognitions (i.e., goals) from our items, each comprising four items, corresponding to either luxury or environmental consciousness.

Table 3
EFA factor loadings.

Goal	Items	Luxury	Environmental Consciousness
G2	Having the highest quality car.	0.773	–
G5	Having a luxurious car.	0.858	–
G15	Having access to a large variety of cars.	0.645	–
G17	Having a car as a status symbol.	0.808	–
G8	Doing something good for the environment.	–	0.870
G11	Protecting the environment	–	0.837
G12	Ensuring social justice by not using more resources than I need.	–	0.755
G14	Being a good citizen or neighbour.	–	0.640

Note. Loadings lower than 0.30 are not displayed in the table.

Table 4
CFA results for goals.

Latent construct	Indicator	*B*	*SE*	*Z*	*β*	*δ*	*α*	*AVE*
Luxury	Having luxurious car.	1.00			0.84	0.29***	0.79	0.51
	Having a car as a status symbol.	0.82	0.05	18.38	0.74***	0.45***		
	Having the highest quality car.	0.91	0.05	18.73	0.76***	0.43***		
	Having access to a large variety of cars.	0.62	0.05	12.10	0.50***	0.76***		
Environmental Consciousness	Doing something good for the environment.	1.00			0.87	0.24***	0.83	0.55
	Protecting the environment	0.95	0.04	22.95	0.85***	0.28***		
	Ensuring social justice by not using more resources than I need.	0.87	0.05	18.34	0.68***	0.54***		
	Being a good citizen or neighbour.	0.68	0.05	14.95	0.57***	0.67***		

Note. $\chi^2 = 26.65$; $df = 19$; $p = 0.072$; $RMSEA = 0.028$; $SRMR = 0.026$; $CFI = 0.99$; $TLI = 0.99$; $^{***}p < 0.001$.

4.2. Structural equation modelling

Using our broadly representative sample of 1,294 participants, we tested our conceptual model (see Fig. 1) using Structural Equation Modelling (SEM). Recall that our model examines long-term cognitions – biospheric, altruistic, and egoistic values – as foundational elements shaping both our extracted two goal factors and the integral components of the Theory of Planned Behaviour (TPB). These TPB-related constructs, in conjunction with perceived behavioural control (PBC) and goals, form the basis for participants' intention to share cars. This intention, in turn, is hypothesised to affect actual car-sharing behaviour alongside with our two goal factors.

Following established guidelines (Ullman and Bentler, 2013), we analysed the measurement model first before integrating structural paths. The outcomes, detailed in Table 5, indicate promising results. Firstly, the model fit indices suggest an acceptable fit ($\chi^2 = 2356.76$; $df = 483$; $p < 0.001$; $RMSEA = 0.055$; $SRMR = 0.062$; $CFI = 0.91$; $TLI = 0.90$). Secondly, all scales exhibit acceptable reliability ($\alpha > 0.70$), with factors showing moderate to strong loadings onto their designated factors ($\beta > 0.47$). Notably, all but two constructs (PBC and egoistic values) surpass the threshold of AVE > 0.5, establishing divergent validity (Fornell and Larcker, 1981). In such cases, Fornell and Larcker, (1981) proposed that divergent validity can be established if the squared correlation between the constructs is lower than the AVE of either construct. Given that the correlation between egoistic values and PBC is low ($r = 0.10$; $r^2 = 0.01$) and the lowest AVE among the two constructs is that of egoistic values (AVE = 0.42), this condition is met. Therefore, all of our measures show acceptable reliabilities and sufficient divergent validity.

We then added the structural paths according to our conceptual model and hypotheses (see Fig. 1). The results of the SEM are presented in Table 6 whereas the overall indirect effects are presented in the Supplemental Materials. The model described the data well ($\chi^2 = 2623.45$; $df = 502$; $p < 0.001$; $RMSEA = 0.057$; $SRMR = 0.071$; $CFI = 0.90$; $TLI = 0.89$). First, we examined H_5, the effects of long-term cognitive functions (egoistic, altruistic, and biospheric values) on short-term cognitive functions (attitudes, subjective social norms, and PBC). Here, our results largely support our hypotheses as values, particularly egoistic values, are associated with all three forms of short-term cognition. For example, the more an individual places importance on egoistic values, the more they think they are in control of using car-sharing services and the more they believe that their social environment will approve of using car-sharing. We then examined H_4, the effects of long-term cognitive functions (egoistic, altruistic, and biospheric values) on medium-term cognitive functions (luxury and environmental consciousness goals). Indeed, our results support these hypotheses. As one would expect, while egoistic values are strongly and positively associated with 'Luxury', altruistic values are negatively related. In other words, the more individual's perceive egoistic values as important (and the less important they find altruistic values), the more important is luxury when thinking about cars. Moreover, the results revealed a positive association between both biospheric and altruistic values and the goal of being environmentally conscious. Again, this does not come as a surprise and mirrors the concept of 'Responsibility' found in previous environmental psychological literature (Bretter et al., 2022). Therefore, our results support H_5.

We then examined H_1, The effects of short-term cognitive functions (attitudes, subjective social norms, and PBC) on car-sharing intentions; and H_3, the effects of medium-term cognitive functions (luxury and environmental consciousness goals) on car-sharing intentions. For H_1, we found positive associations between both PBC and subjective social norms and car-sharing intentions, which aligns with TPB: The more people think that their social circle approves of car-sharing and the more they think they are in control of accessing car-sharing, the stronger the intentions are to use car-sharing. Interestingly, our results also showed a small negative association between attitudes and intentions, suggesting that the more individuals like cars, the smaller their intentions to use car-sharing services. Overall, our results support H_1. In terms of goals, both 'Luxury' and environmental consciousness are positively associated with intentions to use car-sharing services, thus supporting H_3. Although the latter is less surprising, the former is. These findings suggest that car-sharing can indeed be not only understood and framed as a more sustainable travel mode, but it may also appeal to individuals striving for luxury in cars.

Finally, we examined the effect of intentions on actually having used car-sharing services (H_2) and the effect of goals directly on having used car-sharing services (H_4). As expected, and aligned with TPB, we found a strong and positive relationship between intentions and use of car-sharing services, thereby supporting H_2. We also found small effects of goals on actual car-sharing use. In particular, the results showed a positive association between desiring luxury in a car and car-sharing use, thereby further supporting our notion that car-sharing may indeed appeal to people that seek luxurious experiences. Surprisingly, we found a negative

Table 5
CFA results for the overall measurement model.

Latent construct	Indicator	*B*	*SE*	*Z*	*β*	*δ*	*α*	*AVE*
Egoistic values	Social power	1.00			0.71	0.50***	0.76	0.42
	Wealth	0.72	0.04	16.34	0.52***	0.73***		
	Authority	1.20	0.05	23.27	0.81***	0.35***		
	Influential	0.91	0.05	19.57	0.63***	0.61***		
	Ambitious	0.64	0.04	14.95	0.47***	0.78***		
Altruistic values	Equality	1.00			0.75	0.44***	0.80	0.51
	A world at peace	0.76	0.04	20.37	0.63***	0.61***		
	Social justice	1.05	0.04	24.41	0.77***	0.40***		
	Helpful	0.92	0.04	22.37	0.69***	0.52***		
Biospheric values	Preventing pollution	1.00			0.84	0.29***	0.92	0.73
	Respecting the earth	1.01	0.03	39.11	0.87***	0.25***		
	Unity with nature	1.05	0.03	35.78	0.82***	0.33***		
	Preserving nature	1.06	0.03	41.43	0.90***	0.19***		
Attitudes	Cars are…(bad/good)	1.00			0.79	0.37***	0.83	0.55
	Cars are…(harmful/beneficial)	1.06	0.05	23.43	0.66***	0.56***		
	Cars are…(unpleasant/pleasant)	0.91	0.03	29.24	0.81***	0.34***		
	Cars are…(unsatisfying/satisfying)	0.86	0.03	27.88	0.77***	0.40***		
Social norms	If I used car sharing more often, people who are important to me would… (disapprove/ approve)	1.00			0.73	0.47***	0.71	0.55
	Most people who are important to me think that sharing cars is… (undesirable/ desirable)	1.10	0.08	14.63	0.76***	0.42***		
PBC	How much control do you have over whether you use car sharing services?	1.00			0.78	0.39***	0.71	0.49
	How difficult would it be for you to use car sharing services?	0.52	0.04	14.35	0.48***	0.77***		
	It is mostly up to me whether or not to use car sharing services.	0.83	0.05	16.74	0.77***	0.41***		
Luxury	Having luxurious car.	1.00			0.86	0.27***	0.80	0.52
	Having a car as a status symbol.	0.81	0.03	28.09	0.76***	0.43***		
	Having the highest quality car.	0.89	0.03	27.50	0.74***	0.45***		
	Having access to a large variety of cars.	0.63	0.04	18.13	0.51***	0.74***		
Environmental Consciousness	Doing something good for the environment.	1.00			0.86	0.26***	0.82	0.54
	Protecting the environment	1.02	0.03	35.99	0.87***	0.25***		
	Ensuring social justice by not using more resources than I need.	0.88	0.03	25.86	0.67***	0.56***		
	Being a good citizen or neighbour.	0.65	0.03	19.33	0.53***	0.72***		
Intentions	I try to use car sharing services.	1.00			0.81	0.34***	0.92	0.81
	I intend to use car sharing services.	1.12	0.03	42.20	0.94***	0.11***		
	I plan to use car sharing services.	1.18	0.03	41.84	0.93***	0.13***		
Car-sharing use	On average, how often have you used (or are you using) car sharing?	1.00			1.00			

Note. $\chi^2 = 2356.76$; $df = 483$; $p < 0.001$; $RMSEA = 0.055$; $SRMR = 0.062$; $CFI = 0.91$; $TLI = 0.90$; $^{***}p < 0.001$.

relationship of environmental consciousness with actual use of car-sharing. This suggests that, although goals such as 'protecting the environment' and 'ensuring social justice' result in *higher intentions* to use car-sharing, they actually result in *lower use* of car-sharing. Overall, our results support all of our hypotheses and have strong implications for our understanding of car-sharing, which we will unpack in the next section.

5. Discussion

5.1. Theoretical and practical implications

In this paper, we have demonstrated that values understood as long-term cognitions underlie both short- and medium-term cognitions related to car-sharing. Therefore, values need to be understood as one key determinant in affecting behavioural intentions to engage in – and by extension – to use car-sharing. These findings are aligned with the general consensus of the environmental

Table 6
Results of the SEM.

Latent construct	Predictor	β	*SE*	*Z*
Attitudes	Egoistic values	0.35***	0.02	10.33
	Altruistic values	−0.01	0.03	−0.07
	Biospheric values	−0.27***	0.02	−7.17
Social norms	Egoistic values	0.16***	0.02	4.36
	Altruistic values	0.16***	0.03	3.48
	Biospheric values	0.07	0.02	1.60
PBC	Egoistic values	0.13***	0.04	3.76
	Altruistic values	0.04	0.05	0.93
	Biospheric values	−0.04	0.04	−0.99
Goal: Luxury	Egoistic values	0.57***	0.04	15.70
	Altruistic values	−0.15***	0.04	−3.97
	Biospheric values	−0.07*	0.03	−2.04
Goal: Environmental consciousness	Egoistic values	−0.01	0.02	−0.48
	Altruistic values	0.14***	0.03	4.33
	Biospheric values	0.62***	0.03	18.33
Intentions to use car-sharing	Attitudes	−0.07*	0.04	−2.53
	Social norms	0.46***	0.07	12.52
	PBC	0.10***	0.03	3.54
	Luxury	0.10**	0.03	3.47
	Environmental consciousness	0.24***	0.03	8.29
Car-sharing use	Intentions	0.47***	0.05	16.13
	Luxury	0.06*	0.04	2.31
	Environmental consciousness	−0.07*	0.05	−2.52

Note. $\chi^2 = 2623.45$; $df = 502$; $p < 0.001$; $RMSEA = 0.057$; $SRMR = 0.071$; $CFI = 0.90$; $TLI = 0.89$; ***p < 0.001, **p < 0.01, *p < 0.05.

psychological literature. For example, values have been shown to be a key determinant of policy support (Bretter and Schulz, 2024), food waste (Bretter et al., 2023) and recycling behaviour (Best and Mayerl, 2013). On a more granular level, our findings show that egoistic values are positively associated with short-term cognitions such as attitudes while biospheric values are negative related with attitudes. In other words, those who believe that the environment is something important to them see the car more as something 'bad', while those who tend to be more egotistical are more likely to perceive the car as something 'good'. Although unsurprising, these findings show that short-term cognitions may be directly influenced by worldviews and ideologies and that these, in turn, affect car-sharing intentions and behaviour (Hornsey et al., 2016). For practitioners, our findings imply the need to better consider and utilise underlying ideologies when attempting to persuade individuals to use car-sharing. For example, one way to persuade more people to engage in car-sharing is by framing the messages in line with their underlying values (Hornsey and Fielding, 2017). More generally, our findings also highlight the need to understand car-sharing as more than just the result of short-term decision making. Instead, the decision to engage in car-sharing seems to be the result of a complex web of long-, medium-, and short-term cognitions. By appreciating this complexity, we hope to guide more fruitful research in further enhancing our understanding of car-sharing.

In addition, we have extracted two medium-term goals based on a variety of general pro-environmental goals: Luxury and environmental consciousness. While the former corresponds to the perceived importance of 'having a car as a status symbol' and 'having the highest quality car', the latter refers to the need of 'doing something good for the environment' and 'ensuring social justice'. Although neither construct has, to the best of our knowledge, been examined in relation to car-sharing, they are not new. Indeed, the strive for luxurious consumption has a long history in psychological research (for review, see Dubois et al., 2021). In the case of environmental consciousness, many researchers have argued for its importance in predicting various behaviours such as sustainable consumption (Golob and Kronegger, 2019). It is also important to point out that our construct 'environmental consciousness' includes the similar items as the construct 'Responsibility' found by Bretter et al., (2022). Given that we used a similar item pool for the exploratory analysis, this is unsurprising, but provides additional support for the underlying construct. Our results demonstrate that both 'environmental consciousness' and 'luxury' are positively associated with the intention to engage in car-sharing. This is important because it negates the frequently made claim (at least, until recently, see Amatulli et al., 2020) that the desire for luxury always leads to unsustainable consumption (Achabou and Dekhili, 2013). While this claim, of course, often holds true, particularly in the case of conspicuous consumption (Kumar et al., 2022), car-sharing might be an exception where individuals may have the thought of car-sharing as an opportunity to drive those cars that they would normally not be able to afford. Concurrently, those who desire sustainability and are 'environmentally conscious' may also see car-sharing as a means to contribute to a more sustainable society. Therefore, both the desire to experience luxury in cars and the need to live sustainably can be positively related to intentions to engage

in car-sharing, as our results show. For practitioners, these results imply at least two distinct ways to encourage individuals to use car-sharing. First, car-sharing can be promoted by appealing to environmental consciousness. Second, practitioners can further encourage car-sharing by appealing to some of its luxurious facets. For example, they may appeal to the wide range of different cars available or to the fact that car-sharing is not necessarily something for less wealthy people. Our findings demonstrate that there are multiple ways to persuade individuals to consider joining car-sharing schemes. We encourage scholars to conduct experiments and examine the potential of different strategies to encourage car-sharing.

While 'luxury' is not only positively related to the intentions to engage in car-sharing, but also to the actual use of car-sharing, our results show a different pattern for environmental consciousness. We observed a positive relationship between environmental consciousness and individual's intention to use car-sharing, but a negative relationship between environmental consciousness and actual use of car-sharing. Even though the total indirect positive effect of environmental consciousness via intentions ($\beta = 0.11$) is greater in strength than the direct negative effect of environmental consciousness ($\beta = -0.07$), these results are not unfamiliar to psychologists. On the one hand, they support the intention-action gap that psychologists have examined for decades (Sheeran, 2002; Hughes, 2013). On the other hand, they are aligned with findings that suggest only deeply ingrained (internal) cognitions are positively related to sustainable lifestyles, while normative (external) cognitions are negatively related to such lifestyles (Hedlund-de Witt et al., 2014). In other words, given that goals are less abstract and thus less ingrained, compared to values, the goal 'environmental consciousness' might reflect participant's normative desire, that is, what they ought to desire. However, such normative goal did not translate into action when it comes to actually behaving more sustainably, using car-sharing in our case, because the goal was not internalised. Understood in this way, it seems intuitive that environmental consciousness was positive related to intentions, but negatively related to action. Still, it might also be that the correlation between environmental consciousness and intentions resulted in the negative effect of environmental consciousness on car-sharing use. Future research should be encouraged to unpack these relationships in more detail to enhance our understanding on the determinants of car-sharing.

5.2. Limitations

Although we believe that our findings are robust, we see the need to highlight a few limitations. First, we do not make causal claims as causality is impossible to assess with a cross-sectional survey. Therefore, the effects we found between two variables are best understood as correlations rather than as one variable preceding the other. Second, although the panel provider Prolific has a reputation for providing high-quality data (Peer et al., 2017), our data may be subject to desirability bias due to self-reporting. However, self-report measures are commonplace (Donaldson and Grant-Vallone, 2002) and thus our study does not diverge from standard research practices.

6. Conclusions

The aim of this paper was to show that car-sharing may be understood as a behaviour that results from a complex web of long-, medium- and short-term cognitions such as values, goals, and those put forward by the Theory of Planned Behaviour (TPB), respectively. Indeed, our results support this notion and demonstrate that long-term cognitions underlie car-sharing behaviours, mediated via medium-term cognitions and short-term cognitions. We have also drawn out two distinct goals – environmental consciousness and luxury – that underlie intentions to engage in car-sharing as well as actual use of car-sharing. Overall, car-sharing behaviour seems to be more complex than previously anticipated and we hope that our research is a first step in guiding more fruitful enquiries into better understanding, and ultimately promoting, car-sharing.

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CRediT authorship contribution statement

Christian Bretter: Writing – review & editing, Writing – original draft, Supervision, Methodology, Formal analysis, Conceptualization. **Hemant Sharma:** Writing – review & editing, Writing – original draft, Methodology. **Kate Pangbourne:** Writing – review & editing, Writing – original draft.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.trf.2024.10.020.

Data availability

The authors do not have permission to share data.

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