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Preferences for urban street space reallocation to encourage cycling: A Best-Worst Scaling profile case approach☆

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ABSTRACT

Traffic restrictions and the construction of cycling infrastructure are effective strategies to reduce private car use and promote active travel in urban areas. However, implementing these measures often involves reallocating existing street space, which can lead to public resistance. This study employed a Best-Worst-Scaling (BWS) profile case approach to examine preferences for different types of street space reallocation to encourage cycling and to explore how these preferences are influenced by psychological factors such as driver and cyclist identities, perceived infringement on freedom, and place attachment. A Britain-based sample of participants (N = 509) evaluated images depicting various configurations of bike lanes, traffic restrictions, and cycle parking, where road or pedestrian space was reallocated to accommodate cycling infrastructure. Participants identified the most and least preferred features of these designs. The findings indicate broad public support for cycling infrastructure and traffic restrictions, although preferences varied significantly across street layouts. Participants particularly opposed the removal of car parking and showed a strong preference for reallocating road space rather than pedestrian space. Both cyclists and drivers favoured segregated cycling infrastructure over painted bike lanes on roads. While place attachment had limited impact on preferences, perceptions of cycling infrastructure as infringing on individual freedom emerged as a significant factor shaping space reallocation preferences. These findings offer insights for policymakers and urban planners, highlighting design strategies that may be more publicly acceptable and identifying areas where resistance to urban redesigns is likely to emerge.

1. Introduction

Traffic restrictions and new cycling infrastructure are key measures to reduce private car use and encourage active travel in urban areas (Department for Transport, 2021b; Cook et al., 2022). While these initiatives enjoy broad public support (Department for Transport, 2021a; Bosetti et al., 2022), they have also encountered vocal opposition from some local communities (Wild et al., 2018; Markson, 2021). Such resistance can undermine their effectiveness, and in certain cases this opposition has resulted in the subsequent removal of these measures (Portsmouth City Council, 2020; Giordano, 2021). Research highlights that insufficient public support can hinder the successful implementation of climate change and transportation policies in general (Schade and Schlag, 2003; Gärling and Schuitema, 2007; Drews and van den Bergh, 2016), and cycling infrastructure in particular (Wild et al., 2018; Aldred et al., 2019). Therefore, understanding the factors influencing public acceptability is critical.

One critical factor in the acceptability of new infrastructure is their design (Field et al., 2018; Bosetti et al., 2022). A substantial body of literature shows that design affects public support, particularly by shaping perceptions of safety and influencing cyclists' route choices (Sanders, 2016; Poudel and Singleton, 2022). In particular, designs that minimise interactions with motor vehicles are preferred (Monsere et al., 2020). Demographic factors, such as gender and age, also shape design preferences: women and older individuals tend to favour segregated infrastructure due to heightened safety concerns (Tilahun et al., 2007;

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Monsere et al., 2014; Aldred et al., 2017). However, much of this research focuses primarily on the preferences of cyclists, often overlooking the views of other street users, such as drivers and residents. Moreover, limited attention has been given to public preferences regarding the source of reallocated space for cycling infrastructure, specifically, whether it should come from road space, pedestrian areas, or car parking.

Measures to improve cycling infrastructure often require the reallocation of existing street space, given the limited availability of space in urban environments. Such reallocations frequently involve contentious interventions, such as the removal of parking spaces, the narrowing of road lanes, or the implementation of modal filters, which can be especially controversial when they reduce space allocated to cars. This resistance reflects the long-standing prioritisation of cars in urban planning (Urry, 2004; Norton, 2007; Mattioli et al., 2020; Walker et al., 2023). The dominance of the car has established a hierarchy on roads, in which space is assumed to primarily belong to motor vehicles, relegating cyclists, pedestrians, and other users to secondary status (Mattioli et al., 2020). This entrenched car-centric planning approach may help explain both the chronic underinvestment in active travel infrastructure and public resistance to reallocating space away from cars (Furness, 2010; Wang, 2018; Loyola et al., 2023). Such measures then challenge the prevailing status quo and cultural norms surrounding urban mobility (Timmons et al., 2024). Given the historical dominance of cars in urban design, often referred to as *'carchitecture'* (Schiller and Kenworthy, 2017), and the pressing need to transition to more sustainable transport modes, understanding which street space reallocations are publicly acceptable is becoming increasingly important.

Existing research on street space reallocations is limited but suggests that such measures may gain public support when they enhance cycling or walking infrastructure. For example, a survey conducted in Berlin found majority support for a car-free city centre, particularly when accompanied by improvements to cycling and pedestrian facilities; however, the sample was primarily composed of non-car-owning university students (Gundlach et al., 2018). In Barcelona, research showed general support for reallocating space from cars to pedestrians, although this was less pronounced among drivers and cyclists (Nello-Deakin et al., 2024). Similarly, a study in Toronto found that most street users preferred replacing car parking with dedicated cycle lanes, rather than widening pavements or making no changes (Sztabinski, 2009). Drivers, however, may support such reallocations only when they perceive direct personal benefits, such as reduced travel time (Tzamourani et al., 2023). While these findings indicate a general public willingness to accept trade-offs in favour of improved active travel infrastructure, no studies to date have directly examined preferences between different sources of space for cycling infrastructure (e.g., road lanes, pedestrian areas, or parking). This gap is especially relevant in light of the significant reallocation of street space during the COVID-19 pandemic to facilitate walking and cycling (Nikitas et al., 2021; Noland et al., 2023).

While some studies suggest that design preferences can vary based on demographic factors, such as gender (Monsere et al., 2014), age (Aldred et al., 2017), and whether an individual is a resident or a tourist (Campisi et al., 2024), it remains unclear whether psychological factors influence preferences for space allocation. Existing evidence indicates that psychological factors can shape the acceptability of travel demand management (TDM) measures (Eriksson et al., 2006), but most of this research has focused on policies like congestion charging and toll roads (Eliasson and Jonsson, 2011). Cycling infrastructure and traffic restrictions, that aim to reduce CO_2 emissions and improve air quality by encouraging walking and cycling over driving, also fall under the umbrella of TDM strategies. However, limited research has explored how psychological factors specifically affect the acceptability of these types of interventions.

Psychological factors such as transport mode identity, perceived infringement on freedom, and place attachment may significantly influence public attitudes toward the installation of new bike lanes. Transport mode use often forms a core part of an individual's social identity (Steg et al., 2001; Gössling, 2022), and these identities can shape responses to transport policies (Allert and Reese, 2023). According to Social Identity Theory (Tajfel and Turner, 1979), group membership, such as identifying as a 'driver' or 'cyclist', can lead to resistance toward changes perceived as favouring an outgroup (Steg et al., 2001). As a result, individuals may be more accepting of infrastructure that benefits their ingroup and more resistant to measures seen as prioritising others (Aldred, 2013; Gössling, 2022).

Perceptions of infringement on individual or group freedom may further contribute to this resistance. For instance, policies may be interpreted as limiting freedom of movement or choice of transport mode (Brehm, 1966; Brehm and Brehm, 1981). Studies have shown that such perceptions can reduce the acceptability of TDM measures, particularly when those measures are seen as highly restrictive, even if they are viewed as effective in reducing car use (Attari et al., 2009; Jou et al., 2011). Similarly, Loyola et al. (2023) found that support for cycling infrastructure was lower when it was perceived to take space away from drivers, suggesting that perceived infringements on freedom play a key role in shaping public attitudes. This is particularly relevant for bike lanes and traffic restrictions, as different designs and space reallocation strategies may elicit varying degrees of perceived infringement on freedom, depending on how they impact specific transport user groups.

Place attachment, an emotional bond between individuals and their local environment, may further influence the acceptability of urban changes (Scannell and Gifford, 2010). Changes to local areas can disrupt this connection, potentially triggering place-protective responses, such as opposition to proposed changes (Devine-Wright and Howes, 2010; O'Grady, 2020). While there is substantial evidence that place attachment influences public acceptance of green energy infrastructure (Vorkinn and Riese, 2001; Devine-Wright and Howes, 2010), its role in shaping attitudes toward cycling infrastructure remains underexplored. One relevant study by Marcheschi et al. (2022) examined neighbourhood cohesion, a component of place attachment, in relation to attitudes toward car-free streets, a measure aimed at promoting active travel and reducing space for cars. They found that individuals with stronger place attachment expressed more negative attitudes, possibly due to concerns that such changes threatened their perceived quality of life. In contrast, Goetting & Jarass (2023) reported the opposite: individuals with higher place attachment were more likely to support car-free streets, suggesting that emotional connection to place can also motivate support for changes perceived to improve the local environment. These conflicting findings suggest that the relationship between place attachment and support for street reallocation is context dependent. Different forms of cycling infrastructure, and the types of space they reallocate, may disrupt place attachment to varying degrees, thereby influencing public acceptability.

This study investigates public preferences for reallocating street space to accommodate new cycling infrastructure, with a focus on different design configurations. Using a Best-Worst Scaling (BWS) profile case approach, it assesses support for various combinations of bike lanes, traffic restrictions, and cycle parking, where either road or pedestrian space is reallocated. In addition, the study explores how these preferences are shaped by psychological factors, including driver identity, cyclist identity, perceived infringement on freedom, and place attachment. The research aims to generate insights that can inform the design and implementation of cycling infrastructure, supporting more successful outcomes, more efficient use of public funds, and higher rates of cycling uptake.

2. Method

This study employs Best-Worst Scaling (BWS) (Louviere et al., 2015), a survey-based stated preference method grounded in the Random Utility Theory of human decision-making (Flynn and Marley, 2014).

BWS can be applied in three different formats: the object case, the profile case, and the multi-profile case (Flynn and Marley, 2014). This research adopts the profile case approach (Louviere et al., 2015), as it enables direct comparisons between varying amounts of street space reallocation for different measures, making it particularly suited to understanding public preferences for cycling infrastructure design.

2.1. Materials

2.1.1. Best-worst scaling task

In this study, 27 images were created using SketchUp Pro software to depict various street space reallocation scenarios. These images represented an orthogonal fractional factorial matrix of a set of three attributes and their level combinations ($7^1 \times 3^2$), covering a wide range of reallocation possibilities (see, Table 1). Ideally, the generated fractional factorial design should be balanced so that the levels of each attribute have equal frequency of appearance and co-appearance with other attribute-levels in the design matrix (Louviere et al., 2015; p. 61).

As shown in Table 1, the attributes included: (1) bike lanes, (2) traffic restrictions, and (3) cycle parking. For the first attribute, levels reflected different amounts of space reallocated from the road or footpath to create bike lanes. For the second attribute, its levels represented varying degrees of traffic restrictions, such as no restrictions, resident-only access, or resident-only access during peak times. The third attribute included levels indicating different proportions of car-parking space reallocated to create cycle parking. To reduce the respondents' cognitive burden, the 27 images were divided into three (3) blocks of nine (scenarios), with each participant randomly assigned to one of the three blocks.

The scenarios reflected changes to primarily residential urban roads. When presented with a BWS scenario, respondents were asked to consider that their local council is considering several changes to the streets in their local area. These changes were represented on each of the images (scenarios), which depicted different street layouts. Respondents were then asked to make a choice of the 'most preferred' and 'least preferred option' (see, Supplement File).

Each image featured accompanying text describing the specific combination of attribute levels (see, Fig. 1). To ensure construct validity, the images underwent cognitive testing prior to their use in the experiment. Nine participants, recruited through convenience sampling, reviewed the images and accompanying text for clarity and comprehension. They were asked to share their initial thoughts on the streetscape images and associated questions, assess how well they understood the images, suggest any changes they felt were necessary, and comment on the ease and speed of completing the task. Feedback confirmed that participants understood the purpose of the images and found the task straightforward, with minor refinements made based on their suggestions. No changes were made to the visual colour, size, or placement of the images, as these were all well understood by participants. Participants were compensated for their time.

Table 1
Attributes and levels of the street space reallocation scenarios.

Attribute	Level
A. Bike Lanes	A1. No bike lane
	A2. Bike lanes segregated from motor traffic installed eliminating 25% of road space
	A3. Bike lanes segregated from motor traffic installed removing 50% of space of road space
	A4. Painted white bike lanes installed, taking up 25% of road space
	A5. Painted white bike lanes installed, taking up 50% of road space
	A6. 50% of footpath space re-designated for cyclists
	A7. All of footpath shared between cyclists and pedestrians
B. Traffic Restrictions	B1. All vehicle traffic allowed – no restrictions
	B2. Resident-only vehicle traffic and emergency vehicles
	B3. Resident-only vehicle access during peak time (7am-10 pm Mon-Fri, with exceptions for emergency vehicles)
C. Cycle Parking	C1. No cycle parking
	C2. 1 in 10 car parking spaces removed to make space for cycle parking
	C3. 1 in 5 car parking spaces removed to make space for cycle parking

Prior to completing the BWS task, participants were shown the baseline image, which contained no changes (i.e., no bike lanes, no traffic restrictions, and no cycle parking; see Fig. 2). They were then presented with one of three blocks, each containing nine images and accompanying text that reflected different configurations of street space reallocation (see Fig. 1 for example scenarios; the complete set of all scenarios is provided in the Supplementary File). For each of the nine images, participants indicated the attributes of the street reallocation scenarios they most and least preferred.

2.1.2. Survey questions

In addition to the BWS task, participants were asked a number of questions on socio-demographic and psychological factors.

Support or opposition statements: Participants were asked about their level of support or opposition to the installation of bike lanes in their local area. The same question was posed regarding traffic restrictions. Responses were collected using a 5-point Likert scale ranging from "Strongly oppose" to "Strongly support.".

Cyclist and driver identity: These questions aimed to establish whether the respondent identified as a cyclist or driver. Participants rated the importance of being a driver or cyclist to their identity on a 5-point Likert scale from "Not important at all" to "Extremely important." They were also asked if they would feel a sense of loss if they could no longer drive or cycle, with responses ranging from "Strongly disagree" to "Strongly agree." In addition, participants completed two 'inclusion of the self in other' scales (Hoekstra et al., 2018), adapted for cyclist and driver identity. Each scale comprised five diagrams showing varying degrees of overlap (0%, 25%, 50%, 75%, 100%) between two circles. Respondents indicated which diagram best described their relationship with cyclists/drivers as a group. An average score was calculated across all identity items to give an overall identity score for each participant. Participants who scored a 1 or 2 were categorised as having a low cyclist or driver identity, and those who scored a 4 or 5 were categorised as having a high identity. Participants scoring a 3 were excluded from subgroup analyses. The same high–low categorisation was applied to the infringement on freedom and place attachment measures below.

Perceptions of infringement on freedom (IoF): These questions aimed to establish whether respondents viewed bike lanes as an infringement on their personal freedom. Participants were asked to what extent they agreed or disagreed with three statements adapted from Murtagh et al. (2012). Responses were on a 5-point Likert scale from "Strongly disagree" to "Strongly agree".

Place Attachment: Participants were first asked about their sense of belonging to local, national, and global areas using questions adapted from Devine-Wright et al. (2015). Responses ranged 1 ("No sense of belonging") to 5 ("Extremely strong sense of belonging"). Next, participants answered questions adapted from Raymond et al. (2010) regarding the importance of their local area and whether they identified with it. Responses were on a 5-point Likert scale from "Strongly disagree" to "Strongly agree".

2.2. Survey implementation and participants

Participants were recruited through the Qualtrics Survey Panel (N = 509). Eligibility criteria required participants to be resident in Britain and aged 18 or older. The sample was recruited using loose quotas for age, gender, and ethnicity. While the sample shows reasonable distribution across socio-demographic groups, there were some deviations from official population statistics (ONS, 2022a,b). For example, participants aged 65 and over were overrepresented in the sample (24%)

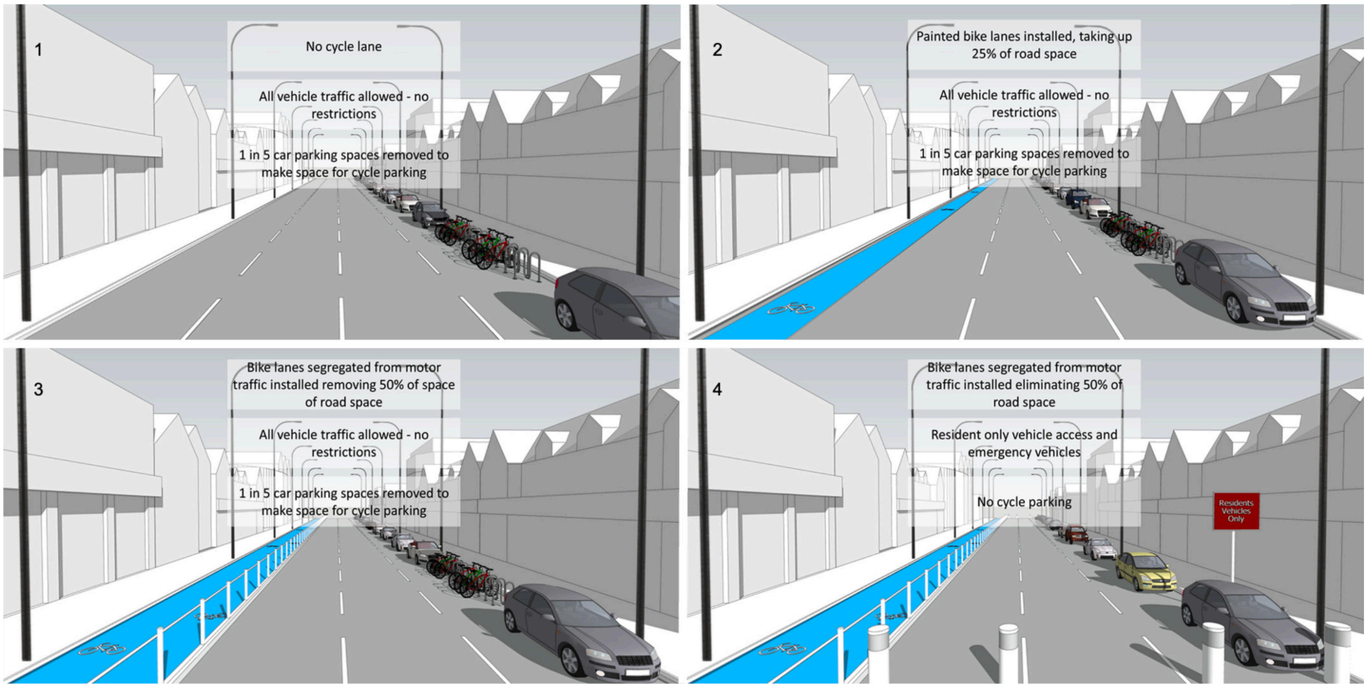

Fig. 1. Four example scenarios to elicit priorities for street space reallocation.

Fig. 2. Baseline image reflecting 'no changes'.

compared to their proportion in the adult population (approximately 18%). Gender representation was relatively balanced and close to national figures (~51% female). Ethnic minorities were somewhat underrepresented, with 83.3% of participants identifying as White compared to around 81% nationally, and relatively lower proportions identifying as Asian (5.1% vs. 9%) or Black (2.4% vs. 4%). While other discrepancies were relatively small, the sample cannot be considered fully representative of the population of Britain. Nevertheless, it includes a broad cross-section of socio-demographic groups. Detailed sample characteristics are presented in Table 2.

2.3. Analytical approach

The data were analysed using count analysis and an error-component logit model. The *count analysis* involved calculating a Standardised Best Worst Score (StdBW), using a calculation of the number of times an attribute was chosen as the best, minus the number of times it was chosen as the worst, divided by the number of times that option as presented (Louviere et al., 2015). The count analysis was conducted using the R package "support.BWS2" (Aizaki, 2019; Aizaki and Fogarty, 2019). Analyses were performed on the full sample as well as across subgroups defined by high and low levels of driver identity, cyclist identity, perceived infringement on freedom, and place attachment.

The count analysis was complemented with an error-component logit model. This model allowed for a probabilistic estimation of how attribute levels influenced participants' best and worst choices, based on random utility theory (Train, 2009). Modelling of the BWS using an error component logit model accounts allows to estimate coefficients reflecting the ranking order of the attribute levels (with confidence intervals) and accounts for the panel nature of the data (i.e., multiple observations coming from a single respondent).

The modelling approach corresponded to the 'paired model with level variables', which assumes that the utility difference between two attribute levels chosen as 'best' and 'worst' corresponds to the greatest utility difference across K*(K-1) utility differences where K is the number of attribute levels shown within a BWS profile/choice task (Aizaki and Fogarty, 2019). Each choice task involves K = 3 attribute levels and thus the number of possible pairs is 6 (=3*(3–1)). For example, if a BWS

Table 2
Characteristics of the sample.

		Number of participants	Proportion
Age	18–24	54	10.6%
	25–34	80	15.7%
	35–44	87	17.1%
	45–54	86	16.9%
	55–64	77	15.1%
	65+	122	24.0%
Gender	Female	274	52.3%
	Male	237	46.2%
	Non-binary/third gender	6	1.0%
Employment Status	Employed full-time (≥30 h per week)	213	41.9%
	Employed part-time (< 30 h per week)	78	15.3%
	Other	111	21.8%
	Student	24	4.7%
	Unemployed	80	15.7%
Region	England (excluding London)		73.5%
	London	62	12.2%
	Scotland	45	9.0%
	Wales	24	4.7%
Ethnicity	Asian or Asian British	26	5.1%
	Black, African, Black British or Caribbean	12	2.4%
	Mixed or multiple ethnic group	6	1.2%
	White	424	83.3%
	Prefer not to say	44	9.0%
	Other	5	1.0%

Note: Percentages may not add up to 100% due to missing values and rounding.

task (profile) shows the attributes levels A1, B2 and C3, there are six possible 'best' and 'worst' pairs: (A1, B2), (A1, C3), (B2, A1), (B2, C3), (C3, A1) and (C3, B2). The assumption in the 'paired model' is that a respondent choosing the pair (A1, B2) as 'best' (A1) and 'worst' (B2) does so by calculating the six utility differences with the difference in the utility between A1 and B2 being the maximum difference across all six utility differences.

Assuming that the utility of an attribute level being selected as 'worst' is negative and that the stochastic component of the utility v follows the Gumbel Distribution, the probability of selecting attributes levels i and j as 'best' and 'worst', respectively, with i *1* j from a choice set of C = 6 option pairs can be defined as conditional logit model as follows (Aizaki, 2019):

$$Pr(best = i, worst = j) = \frac{\exp\left(v_i - \mu_{worst} v_j\right)}{\sum_{p,q \subset C, p \neq q} exp\left(v_p - \mu_{worst} v_q\right)} \quad (1)$$

where p and q are all possible best (p) and worst (q) attribute levels in each BWS task and μ_{worst} captures the scale difference between 'best' and 'worst' data and their direct utilities, respectively, thus enabling joint estimation (Hensher and Bradley, 1993).

The observed utility function v of choosing an attribute level l for an individual k in a choice card t in a paired model with only attribute-level dummy-coded variables is:

$$v = \beta_{A1} DA_1 + \cdots + \beta_{A7} DA_7 + \beta_{B1} DB_1 + \beta_{B2} DB_2 + \beta_{B3} DB_3 + \beta_{C2} DC_2 + \beta_{C3} DC_3 \quad (2)$$

where DA_k, DB_l and DC_m are dummy-coded variables of attribute A (Bike Lanes) with levels $k = 1–7$, attribute B (Traffic Restrictions) with levels $l = 1–3$ and attribute C (Cycle Parking) with levels $m = 2$ and 3. When the utility in equation [2] is specified for the choice an attribute level chosen as 'worst' the sign of the attribute-level dummy coded variables is reversed. For example, the attribute-level variable DA_1 takes the value of −1 when is specified in the utility of the 'worst' level, 1 if the attribute level A_1 is specified in the utility of the 'best' level, and zero otherwise. The attribute level DC_1 is (arbitrarily) chosen as the reference level and thus its parameter (weight) is set to zero relative to which all the other parameters $\beta A_k, \beta B_l$ and βC_m are estimated and interpreted.

To account for the panel dimension of the BWS data (serial correlation) across participants and the correlation between alternatives we have introduced a normally distributed error component η with variance σ to be estimated. Therefore, the observed utility v for choosing an attribute level is:

$$v = \beta_{A1} DA_1 + \cdots + \beta_{A7} DA_7 + \beta_{B1} DB_1 + \beta_{B2} DB_2 + \beta_{B3} DB_3 + \beta_{C2} DC_2 + \beta_{C3} DC_3 + \eta \quad (3)$$

More formally, the observed utility of an attribute level of the attributes A (Bike Lanes), B (Traffic Restrictions) and C (Cycle Parking) being chosen as 'best' by individual z in a BWS task will be:

$$v_{Azt} = \beta_{A1} DA_{1zt} + \cdots + \beta_{A7} DA_{7zt} + \eta_{Az} \quad (4)$$

$$v_{Bzt} = \beta_{B1} DB_{1zt} + \beta_{B2} DB_{2zt} + \beta_{B3} DB_{3zt} + \eta_{Bz} \quad (5)$$

$$v_{Czt} = \beta_{C2} DC_2 + \beta_{C3} DC_3 + \eta_{Cz} \quad (6)$$

The above utilities also apply to the 'worst' choices with negative dummy coding as mentioned above. It is worth highlighting that the variances of these error components were constrained to be equal across alternatives as the aim was to capture the correlation across choices within respondents while ensuring model identification and parsimony.

The choice probability that individual z chooses a series of best-worst pairs ($v_i - \mu_{worst} v_j$) across the BWS tasks is given by:

$$Pr(best = i, worst = j) = \int \prod_{t=1}^{T} \frac{\exp\left(v_i - \mu_{worst} v_j\right)}{\sum_{p,q \subset C, p \neq q} exp\left(v_p - \mu_{worst} v_q\right)} f(\eta) d(\eta), \forall z, i, j \quad (7)$$

The above is an error-component logit model which accounts for inter-individual responses (serial correlation) and was estimated by maximum simulated likelihood using 1000 MHLS draws (Hess et al., 2006) in the R package 'Apollo' (Hess and Palma, 2019).

3. Findings

The data were analysed using two methods: count analysis and an error-component logit model. A regression analysis comparing the results of these two methods revealed a high correlation ($r = 0.98$, $p < 0.001$), indicating strong concordance between the findings.

3.1. Count analysis

The standardised Best-Worst (StdBW) scores are presented in Fig. 3. A positive StdBW score indicates that an attribute level was selected as 'best' more frequently than 'worst', whereas a negative score reflects the opposite. Overall, the most preferred attribute level was segregated bike lanes occupying 25% of road space (A2), while the least preferred was no cycle parking (C1). Within the 'bike lanes' attribute, the lowest preference was for no bike lane (A1). The highest preference was for segregated bike lanes occupying 25% of road space (A2), closely followed by painted white bike lanes occupying 25% of road space (A4). Options involving the removal of 50% of road or footpath space (A3 and A5), as well as options of shared footpaths for pedestrians and cyclists (A6 and A7), had scores near zero. This suggests these options were neither strongly favoured nor strongly opposed. These findings indicate a general preference for reallocating space from roads rather than footpaths to accommodate bike lanes. In the 'traffic restrictions' attribute, the most preferred level was resident-only vehicle access (B2). Other options, such as all-vehicle access (B1) and resident-only access

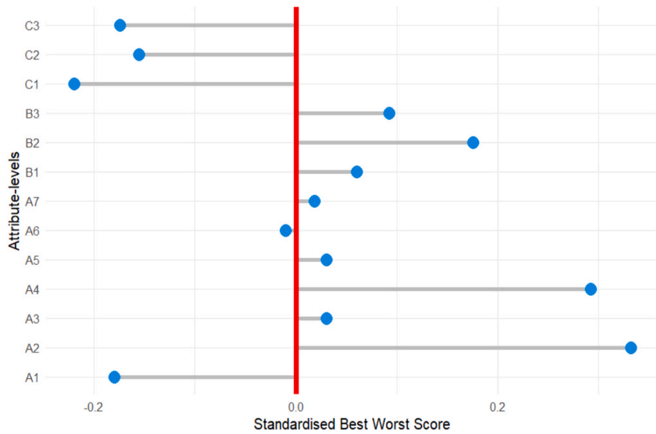

Fig. 3. The standardised best-worst score (StdBW) for the different attribute levels.

during peak hours (B3), received slightly lower but still positive scores. Regarding cycle parking, the absence of cycle parking (C1) was the most negatively rated attribute level across the entire set. However, options that removed parking spaces to make room for it (C1 And C2) received relatively low preference scores, suggesting a reluctance to sacrifice car parking.

3.2. Error-component logit model

The count analysis in Table 3 shows that all attribute levels were selected as either 'best' or 'worst' more than hundred times. Therefore, the utility effect of all attribute levels can be estimated and the corresponding parameter in choice model would not run into identification issues due to low frequency of selection (Aizaki, 2019). Based on the error-component logit model specification discussed in Section 2.3, Table 3 and Fig. 4 present the utility coefficients for each attribute level derived from the error-component logit model and their confidence intervals. The analysis used 'No cycle parking' (C1) as the reference category, as it had the lowest utility coefficient (see Fig. 4). Accordingly, the utility values for all other attribute levels are interpreted relative to this baseline.

The attribute level with the highest utility, and therefore the strongest preference (and thus highest ranking), was 'segregated bike lanes occupying 25% of road space' (A2), followed by 'painted white bike lanes occupying 25% of road space' (A4). As indicated by the p-values in Table 3, the parameters of all attribute levels – except for 'no bike lanes' (A1) and '1 in 5 car parking spaces removed to make space for cycle parking' (C3) – were significantly different from zero, thereby revealing the ranking of those attribute levels relative to the reference category ('no cycle parking', C1). The parameter of attribute level C2 ('1 in 10 car parking spaces removed to make space for cycle parking') was significantly different from zero at the 10% level. This implies that respondents considered 'no cycle parking' (C1, the reference category), 'no bike

Table 3
The best-worst scores and error component logit estimates.

	Count Analysis				Error-Component Logit Model			
	Best (B)	Worst (W)	B-W	Std. BW	Coeff.	St. Error	t-stat	p-value (2-sided)
A. Bike Lanes								
A1. No bike lanes	230	427	−197	−0.180	−0.034	0.114	−0.300	0.764
A2. Bike lanes segregated from motor traffic installed eliminating 25% of road space	575	226	349	0.332	1.607	0.114	14.150	0.000
A3. Bike lanes segregated from motor traffic installed removing 50% of space of road space	137	121	16	0.030	0.926	0.136	6.822	0.000
A4. Painted white bike lanes installed, taking up 25% of road space	270	117	153	0.292	1.457	0.149	9.763	0.000
A5. Painted white bike lanes installed, taking up 50% of road space	135	118	17	0.030	0.825	0.134	6.167	0.000
A6. 50% of footpath space re-designated for cyclists	127	133	−6	−0.010	0.821	0.136	6.049	0.000
A7. All of footpath shared between cyclists and pedestrians	200	193	7	0.018	0.819	0.135	6.091	0.000
B. Traffic Restrictions								
B1. All vehicle traffic allowed – no restrictions	445	358	87	0.060	0.869	0.109	7.940	0.000
B2. Resident-only vehicle access (with exception for emergency vehicles)	646	380	266	0.176	0.998	0.102	9.748	0.000
B3. Resident only vehicle access during peak time (7am-10 pm Mon-Fri, with exceptions for emergency vehicles)	522	379	143	0.093	0.828	0.103	8.009	0.000
C. Cycle Parking								
C1. No cycle parking	264	604	−340	−0.220	Reference level			
C2. 1 in 10 car parking spaces removed to make space for cycle parking	285	523	−237	−0.156	0.184	0.096	1.915	0.056
C3. 1 in 5 car parking spaces removed to make space for cycle parking	228	486	−258	−0.174	0.064	0.094	0.681	0.496
μ_{worst}					0.107	0.046	2.321	0.020
σ					0.828	0.040	20.752	0.000
	Number of observations				4473			
	Log-likelihood (initial)				−8014.54			
	Final Log-likelihood (final)				−7360.34			
	Rho-squared				0.081			

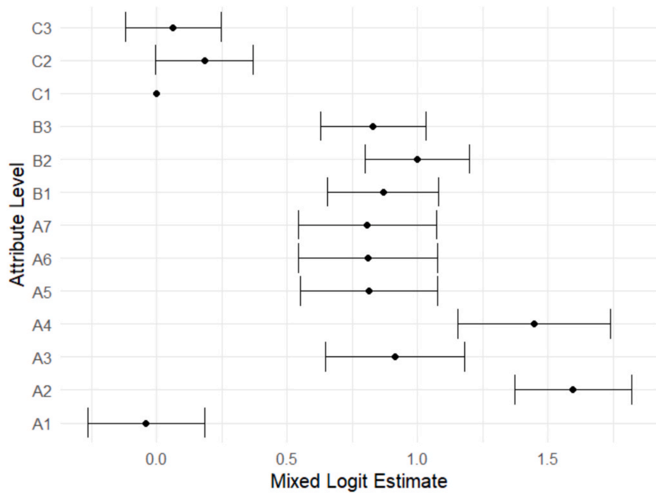

Fig. 4. Coefficient scores and 95% confidence intervals across all participants for each attribute level.

lanes' (A1), and '1 in 5 car parking spaces removed to make space for cycle parking' (C3) as equally preferred. Furthermore, the estimated parameters for attribute levels A5–A7 – representing the allocation of 50% of road space (A5), 50 % of footpath space (A6), or the entirety of footpath space (A7) to cyclists, were not statistically different (see Fig. 4), suggesting that these interventions were perceived as equivalent in terms of preference ranking.

As shown in Table 3, the estimated variance (σ) is highly significant ($p < 0.001$), confirming the presence of serial correlation in the BWS data arising due to repeated observations from the same respondent, which the model accounts for. Finally, the scale parameter μ_{worst} is significant at the 5% indicating the added value of incorporating the 'worst' choice data in the model thus justifying the joint estimation of the 'best' and 'worst' choice data.

3.3. Subgroup analysis

3.3.1. Driver identity

Fig. 5 presents the standardised Best-Worst (StdBW) scores for participants with high and low levels of driver identity. The analysis revealed clear differences in preferences between the two subgroups. Participants with low driver identity preferred reallocating 25% of road space for bike lanes (A2, A4) over reallocating 50% of road space (A3, A5). The same pattern was observed among those with high driver identity, though their overall preference for reallocation was lower compared to the low driver identity group. Both subgroups rated the 'no bike lane' option (A1) negatively, with participants in the low driver identity group rating it more negatively. Interestingly, participants with high driver identity expressed a stronger preference for reallocating footpath space to install cycling infrastructure (A6, A7) than those with low driver identity.

Regarding traffic restrictions, both subgroups rated resident-only access (B2) and resident-only access during peak times (B3) positively. However, participants with high driver identity showed a stronger preference for the 'no traffic restrictions' option (B1), while those with low driver identity expressed a stronger preference for resident-only access (B2).

Finally, participants with high driver identity were particularly opposed to the removal of parking spaces to provide cycle parking (C2, C3). The 'no cycle parking' option (C1) was rated negatively by both subgroups.

3.3.2. Cyclist identity

Fig. 6 presents the StdBW scores for participants with high and low levels of cyclist identity. The analysis revealed notable differences in preferences between the two subgroups. Participants with high cyclist identity rated all bike lane options (A2-A7) positively and gave a strong negative rating to the 'no bike lane' option (A1). Those with low cyclist identity were less supportive overall and expressed particularly negative preferences for reallocating 50% of road space (A3, A5). They also rated the 'no bike lane' option (A1) negatively, although to a lesser extent than the high cyclist identity group. Participants with high cyclist identity showed a negative preference for reallocating footpath space for bike lanes (A6, A7), while those with low cyclist identity showed weak positive preferences for these options.

In terms of traffic restrictions, participants with high cyclist identity gave scores close to zero for all options (B1-B3). In contrast, participants with low cyclist identity rated all three traffic restriction options positively. These findings suggest that traffic restrictions may not be a significant concern for those with a strong cyclist identity.

Finally, participants with high cyclist identity were particularly opposed to the 'no cycle parking' option (C1), which received a strong negative score. They also rated the removal of one in ten (C2) and one in five (C3) car parking spaces to provide cycle parking negatively. However, the one in five removal option (C3) received the least negative score among the three, though it still remained below zero. Participants with low cyclist identity also gave negative ratings to all three cycle parking options. Their strongest opposition was directed at the removal of parking spaces (C2, C3), while the 'no cycle parking' option (C1) was rated slightly less negatively than by the high cyclist identity group. While all three options received negative scores from both subgroups, it is notable that even those with a strong cyclist identity, who otherwise supported bike-related infrastructure, showed low preferences for cycle parking options involving the removal of car parking. It is not clear why

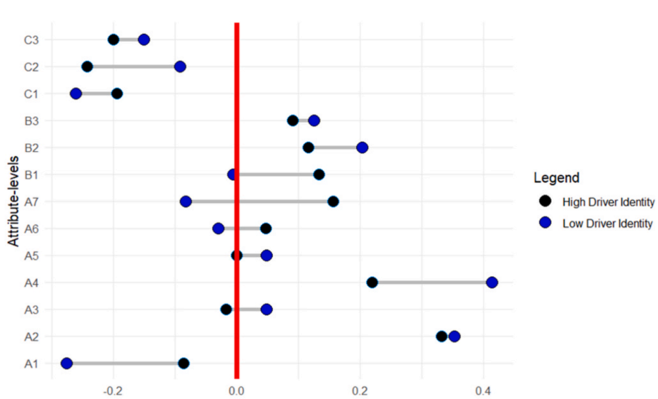

Fig. 5. StdBW scores for high and low driver identity subgroups.

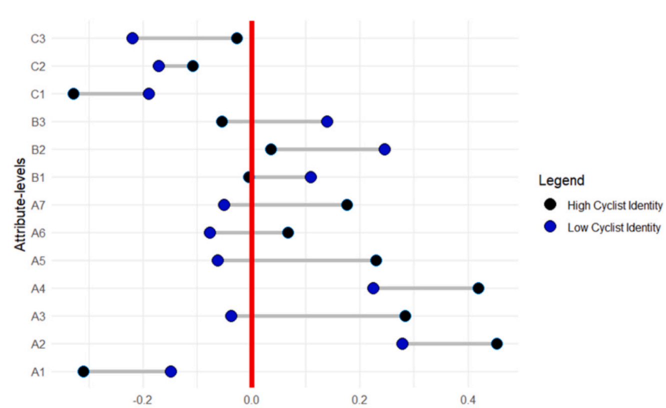

Fig. 6. StdBW scores for high and low cyclist identity subgroups.

these options were rated negatively, even by participants with a strong cyclist identity.

3.3.3. Perceived infringement on freedom

Fig. 7 presents the StdBW scores for participants with high and low levels of perceived infringement on freedom. The analysis revealed distinct patterns between the two subgroups. Participants with high perceived infringement of freedom particularly expressed negative preferences for reallocating 50% of road space for bike lanes (A3, A5) and were the only subgroup to rate the 'no bike lane' option (A1) positively. They also showed a negative preference for reallocating footpath space for cycling infrastructure (A6), while their ratings for the remaining options (A2, A4, A7) were close to zero. In contrast, participants with low perceived infringement on freedom strongly preferred reallocating 25% of road space for bike lanes (A2, A4), and expressed moderately positive preferences for the 50% reallocation options (A3, A5). They gave a strong negative rating to the 'no bike lane' option (A1). Their ratings for the shared footpath options (A6, A7) were close to zero.

In relation to traffic restrictions, participants with high perceived infringement on freedom had a strong positive preference for all-vehicle access (B1) and resident-only access (B2), and a slightly lower preference for resident-only access during peak hours (B3). In contrast, those with low perceived infringement on freedom showed a negative preference for the all-vehicle access option (B1), and mildly positive preferences for both resident-only access (B2) and peak-time restrictions (B3).

Finally, both high and low infringement on freedom subgroups agreed that the options 'no cycling parking' (C1), 'removal of one in ten parking spaces' (C2), and 'removal of one in five parking spaces' (C3) were lower priorities, as indicated by their negative StdBWS scores in Figure 7. However, there were differences in the strength of these preferences: the high infringement on freedom subgroup rated the removal of some parking spaces (C2 and C3) lower than the low infringement on freedom subgroup, while it assigned a relatively higher (though still negative) score to the option of 'no cycling parking' (C1).

3.3.4. Place attachment

StdBW scores for participants with high and low levels of place attachment are presented in Fig. 8. Compared to differences observed in perceived infringement on freedom, variations between these subgroups were relatively modest. Both subgroups expressed positive preferences for reallocating 25% of road space for bike lanes (A2, A4), with higher scores among those with high place attachment. Both groups also showed mild positive preferences for the 50% reallocation options (A3, A5). The 'no bike lane' option (A1) was rated negatively by both groups, with participants high in place attachment being slightly more negative. Ratings for reallocating footpath space for bike lanes (A6, A7) were close to zero in both groups, although negative among participants with low place attachment.

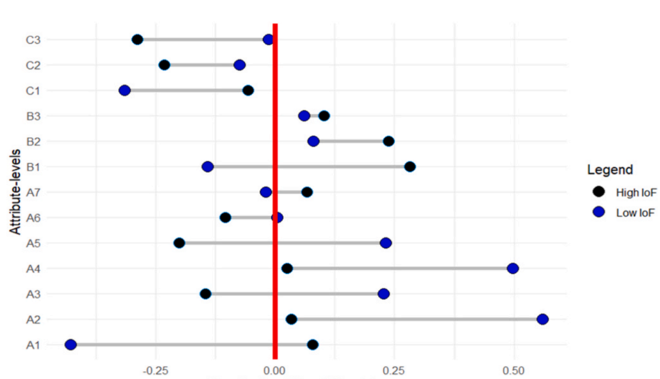

Fig. 7. StdBW scores for high and low infringement on freedom (IoF) subgroups.

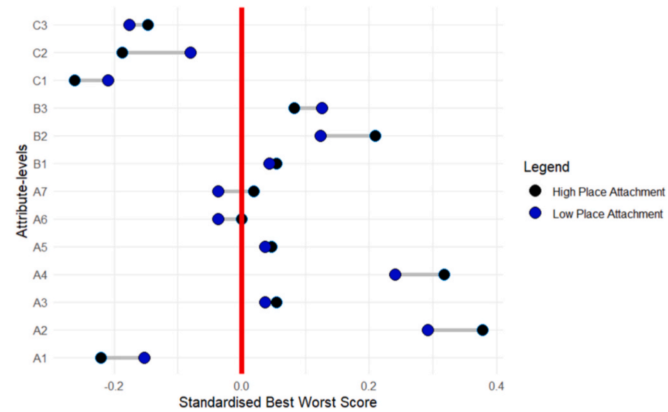

Fig. 8. StdBW scores for high and low place attachment subgroups.

In terms of traffic restrictions, participants with low place attachment showed the strongest preference for resident-only vehicle access during peak hours (B3), while those with high place attachment preferred resident-only access at all times (B2). Both groups rated traffic restrictions positively overall, but with slightly different priorities. Regarding cycle parking, both subgroups expressed negative preferences for the 'no cycle parking' option (C1). However, participants with high place attachment had a more negative preference for the removal of one in ten car parking spaces to provide cycle parking (C2), compared to those with low place attachment. Both groups rated the removal of one in five car parking spaces (C3) equally negatively.

4. Discussion

4.1. Summary of findings

This study aimed to identify public preferences for different street-space reallocations for new cycling infrastructure and to examine how these preferences vary across psychological factors, including driver identity, cyclist identity, place attachment, and perceived infringement on freedom. Using a Best-Worst Scaling (BWS) profile case methodology, the data were analysed through count analysis and error-component logit modelling, yielding largely comparable results between the two approaches. The findings contribute to existing evidence that the public is generally supportive of new cycling infrastructure and traffic restrictions (Department for Transport, 2021a; Bosetti et al., 2022), although some reallocations are more acceptable than others. Particularly, participants strongly opposed removing car parking spaces and preferred reallocating road space rather than pedestrian space to create bike lanes. Consistent with prior research (Sanders, 2016), segregated bike lanes were favoured over painted lanes. While differences between those with high and low driver and cyclist identities were observed, the largest variation occurred among those who perceived cycling infrastructure as an infringement on freedom.

This study highlights the importance of design in securing public support for new infrastructure (Field et al., 2018; Bosetti et al., 2022). Preferences for segregated bike lanes and general opposition to 'no bike lanes' and 'no cycle parking' reinforce these findings. Participants showed a strong preference for reallocating road space over pedestrian space, even among those with high driver identity, suggesting a broad acceptance of balanced street space distribution (Tzamourani et al., 2023). However, options involving the removal of car parking spaces were consistently rated negatively across all subgroups, including by those with a strong cyclist identity. This suggests a reluctance, even among cyclists, to support infrastructure changes that come at the expense of car parking. While the reasons for this are not entirely clear, it may reflect an embedded motonormative bias (Walker et al., 2023), or the fact that many cyclists in the UK also own cars and therefore may be reluctant to lose parking access themselves. These findings highlight the ongoing need to balance space for cycling infrastructure with public sensitivities around parking availability, which remains a contentious issue in many urban areas (Gössling and Cohen, 2014; Rissel et al., 2018; Wang, 2018).

Public views on traffic restrictions, such as resident-only vehicle access, were generally positive, which contradicts media narratives that portray such measures as controversial (Walker, 2021; Hymas, 2023; Davis, 2024). While there were some differences across subgroups, for example, participants with a high driver identity preferred all-vehicle access more than others, resident-only access was still evaluated positively by nearly all subgroups, including drivers. Overall, consistent and clearly defined traffic restrictions were preferred over more ambiguous alternatives, such as time-based restrictions, suggesting a public preference for clarity and predictability in road rules.

Similarly, although there were relative differences in preferences for space reallocation across subgroups, all participants consistently rated the 'no bike lane' option lowest. This included participants with a high driver identity and low cyclist identity, suggesting broad public support for some form of cycling infrastructure. Overall, reallocating 25% of road space was preferred over 50%, and segregated bike lanes were more liked than painted lanes; although participants with high driver identity showed a relative preference for painted bike lanes over segregated ones. Despite these subgroup-level variations, the findings show strong and consistent support across all groups for moderate and clearly defined space reallocations, especially for segregated cycling infrastructure (Tilahun et al., 2007; Monsere et al., 2014; Aldred et al., 2017; Monsere et al., 2020).

Further subgroup analyses revealed that place attachment had relatively minimal influence on preferences, with a few exceptions, most notably that there is stronger opposition to the removal of parking spaces among those with high place attachment. Both high- and low-attachment groups preferred the addition of cycling infrastructure over its absence, although individuals with high place attachment rated these changes slightly less positively. This suggests that cycling infrastructure may be viewed as a positive form of change, aligning with the view that place attachment is primarily disrupted by negative or unwanted changes (Devine-Wright and Howes, 2010).

In contrast to other psychological factors, the most pronounced differences in preferences were observed between participants with high and low perceptions of infringement on freedom, highlighting the central role of this factor in shaping attitudes toward street space reallocation. Participants who perceived bike lanes as infringing on their freedom were the only subgroup to prefer both the 'no bike lanes' and 'no traffic restrictions' options over alternatives. They also showed the strongest support for the 'no cycle parking' option. These results confirm earlier research showing the importance of seeing changes as an attack on car users' freedom (Fujii et al., 2004; Eriksson et al., 2006), rather than as a rebalancing of space for the benefit all road users. This underscores the importance of perceived fairness in public acceptance of environmental policies, when fairness is perceived to be lacking lacking, resistance is more likely (Ejelöv and Nilsson, 2020; Poortinga, 2025). Future research should further investigate the origins of perceived infringement, particularly how it relates to motonormativity biases that place drivers' needs over other those of other road users (Walker et al., 2023).

4.2. Strengths and limitations

This study used the BWS profile case as an alternative to Likert scales to explore preferences for cycling infrastructure (Sanders and Judelman, 2018; Tzamourani et al., 2023). BWS offers several advantages over other methods: it reduces cognitive load by asking participants to select only the best and worst options, provides richer data than single-choice methodologies, and avoids biases associated with interpreting rating scales differently (Marley and Louviere, 2005; Potoglou et al., 2011). This methodology enabled the evaluation of multiple aspects of cycling infrastructure without overburdening participants.

A strength of this study is the focus on psychological predictors, including transport-related identities, perceived infringement on freedom, and place attachment. These are underexplored in transport planning literature and provide insight into non-demographic sources of opposition or support for street reallocation. However, that is not to say that they are the only relevant factors. It would also be valuable to explore other factors, including socio-demographic differences, such as gender, or geographic location, to better understand how preferences may vary across population groups. For example, certain features, such as access restrictions, may be less acceptable in specific regions (Poortinga et al., 2023). Future studies could integrate both psychological and demographic variables to investigate how these dimensions interact in shaping public attitudes toward street space reallocation; for example by estimating integrated latent variable and choice models (ICLV) (Daly et al., 2012).

However, the approach also has limitations. Firstly, the forced-choice design did not include an opt-out option, which might have allowed participants to indicate if none of the presented options were acceptable (Campbell and Erdem, 2019). While the inclusion of 'no bike lanes,' 'no traffic restrictions,' and 'no cycle parking' aimed to address this issue, it remains a potential limitation. Secondly, social desirability bias may have influenced responses, with participants potentially favouring options perceived as fair or environmentally friendly. The online nature of the survey likely reduced this bias to some extent. Thirdly, this study was concerned with the hypothetical implementation of future bike lanes and traffic restrictions on a residential urban street without the experiment highlighting any impacts upon travel behaviour and road network performance in the area or the city. For example, the availability of new cycling infrastructure on the street could result in behaviour change and modal shift (from driving to cycling) or reduce road-traffic performance and increase collisions due to detours thus increasing resistance by local communities. Future experiments could elaborate on eliciting priorities in relation to both alterations to local attributes and potentially the wider implications of these changes onto network performance and modal shift. Finally, existing research has identified that, for TDM strategies, there are differences in levels of support for hypothetical changes, in comparison to actual changes (Schmitz et al., 2019). Future work could examine whether the preferences identified in this study continue to apply after the changes are made.

4.3. Policy implications

The findings of this study offer actionable insights for policymakers and urban designers by highlighting public preferences regarding urban street space reallocation. Broad support was found both among cyclists and drivers for segregated bike lanes, as well as a clear preference for reallocating road space rather than pedestrian space, suggesting that concerns about public resistance or limited space should not prevent the implementation of bike lanes or traffic restrictions. These preferences align with current UK Government guidelines for cycle infrastructure design (Department for Transport, 2020). Importantly, the perception that cycling infrastructure infringes on individual freedom emerged as a main barrier to public acceptance. Designing bike lanes that reduce this perception, through clear road demarcations and dedicated cycling spaces, may help mitigate opposition, particularly from those who identify strongly as a driver or value existing road priorities. Additionally, while cycle parking is generally supported, opposition may arise when it significantly reduces car parking availability. Striking a balance between providing adequate cycle parking and retaining some car parking may be critical to maintaining public support for urban redesigns.

5. Conclusion

This study offers valuable insights into public preferences for urban street space reallocation to promote cycling. The results highlight wide support for new cycling infrastructure and traffic restrictions, in particular for segregated cycle lanes and the reallocation of road space rather than pedestrian space. Furthermore, the results indicate that thoughtfully designed cycling infrastructure can gain significant public acceptance, even among groups with strong driver identities and local area residents. These preferences suggest that public resistance should not be considered a major barrier to building new bike lanes and/or implementing new traffic restrictions or Low Traffic Neighbourhoods (LTNs). Further, this research has highlighted areas where public support could be increased. For example, addressing perceptions of infringement on freedom and minimizing disruptions to car parking spaces are crucial for increasing public support. Furthermore, there are many other psychological factors which have been identified as important in the acceptability of TDM strategies (Eriksson et al., 2006). Future research could focus on identifying whether these factors also influence support for different designs of bike lanes and traffic restrictions. These findings provide insights for to urban planners and decision-makers on how to maximise acceptability of design and implementation of bike lanes and traffic restrictions, enabling more successful outcomes, efficient use of public funds, and increased levels of cycling.

CRediT authorship contribution statement

Isabella Malet Lambert: Conceptualisation, Methodology, Software, Data Curation, Investigation, Resources, Formal analysis, Visualisation, Writing – original draft, Writing – review & editing. **Wouter Poortinga:** Conceptualisation, Writing – original draft, Writing – review & editing; Validation, Supervision, Funding Acquisition. **Dimitris Potoglou:** Conceptualisation, Methodology, Software, Formal analysis, Writing – original draft, Writing – review & editing; Validation, Supervision, Funding Acquisition. **Dimitrios Xenias:** Conceptualisation, Writing – original draft, Writing – review & editing; Validation, Supervision, Funding Acquisition.

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.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.tbs.2025.101205.

References

H. Aizaki (2019). support.BWS2: Basic functions for supporting an implementation of Case 2 Best-Worst Scaling. Available at: https://CRAN.R_project.org/package=support.BWS2 [Accessed: 29/05/2025].

Aizaki, H., Fogarty, J., 2019. An R package and tutorial for case 2 best–worst scaling. J. Choice Modell. 32, 100171. https://doi.org/10.1016/j.jocm.2019.100171.

Aldred, R., 2013. Incompetent or too competent? Negotiating everyday cycling identities in a motor dominated society. Mobilities 8 (2), 252–271. https://doi.org/10.1080/17450101.2012.696342.

Aldred, R., Elliott, B., Woodcock, J., Goodman, A., 2017. Cycling provision separated from motor traffic: a systematic review exploring whether stated preferences vary by gender and age. Transp. Rev. 37 (1), 29–55. https://doi.org/10.1080/01441647.2016.1200156.

Aldred, R., Watson, T., Lovelace, R., Woodcock, J., 2019. Barriers to investing in cycling: Stakeholder views from England. Transp. Res. A Policy Pract. 128, 149–159. https://doi.org/10.1016/j.tra.2017.11.003.

Allert, V., Reese, G., 2023. Social identity based motivation to engage in collective action supporting the redistribution of street space. Transport. Res. F: Traffic Psychol. Behav. 94, 9–24. https://doi.org/10.1016/j.trf.2023.01.009.

Attari, S.Z., Schoen, M., Davidson, C.I., DeKay, M.L., Bruine de Bruin, W., Dawes, R., Small, M.J., 2009. Preferences for change: do individuals prefer voluntary actions, soft regulations, or hard regulations to decrease fossil fuel consumption? Ecol. Econ. 68 (6), 1701–1710. https://doi.org/10.1016/j.ecolecon.2008.10.007.

Bosetti, N., Connelly, K., Harding, C. and Denean, R. (2022). *Street Shift: The Future of Low-Traffic Neighbourhoods*. Available at: https://www.centreforlondon.org/wp-content/uploads/2022/06/CFL-StreetShift-LTNs-Final.pdf [Accessed: 29/05/2025].

Brehm, J.W., 1966. A Theory of Psychological Reactance. Academic Press, New York.

Brehm, S.S., Brehm, J.W., 1981. Psychological Reactance: A Theory of Freedom And Control. Academic Press, New York.

Campbell, D., Erdem, S., 2019. Including opt-out options in discrete choice experiments: issues to consider. Patient: Patient-Cent. Out. Res. 12 (1), 1–14. https://doi.org/10.1007/s40271-018-0324-6.

Campisi, T., Moslem, S., Al-Rashid, M.A., Tesoriere, G., 2024. Optimal urban planning through the best–worst method: bicycle lanes in Palermo, Sicily. Proc. Inst. Civil Eng. Transport 177 (4), 203–213. https://doi.org/10.1680/jtran.22.00013.

Cook, S., Stevenson, L., Aldred, R., Kendall, M., Cohen, T., 2022. More than walking and cycling: what is 'active travel'? Transp. Policy 126, 151–161. https://doi.org/10.1016/j.tranpol.2022.07.015.

Daly, A., Hess, S., Patruni, B., Potoglou, D., Rohr, C., 2012. Using ordered attitudinal indicators in a latent variable choice model: a study of the impact of security on rail travel behaviour. Transportation 39 (2), 267–297. https://doi.org/10.1007/s11116-011-9351-z.

Davis, M., 2024. Low traffic neighbourhood scheme axed. BBC News. Available at: https://www.bbc.co.uk/news/articles/c0kk5kk71dyo [Accessed: 29/05/2025].

Department for Transport (2020). *Cycle Infrastructure Design*. Available at: https://www.gov.uk/government/publications/cycle-infrastructure-design-ltn-120 [Accessed: 29/05/2025].

Department for Transport (2021a). *Gear Change: One year on*. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1007815/gear-change-one-year-on.pdf [Accessed: 29/05/2025].

Department for Transport (2021b). *Transport Decarbonisation Plan*. Available at: https://www.gov.uk/government/publications/transport-decarbonisation-plan [Accessed: 29/05/2025].

Devine-Wright, P., Howes, Y., 2010. Disruption to place attachment and the protection of restorative environments: a wind energy case study. J. Environ. Psychol. 30 (3), 271–280. https://doi.org/10.1016/j.jenvp.2010.01.008.

Devine-Wright, P., Price, J., Leviston, Z., 2015. My country or my planet? Exploring the influence of multiple place attachments and ideological beliefs upon climate change attitudes and opinions. Glob. Environ. Chang. 30, 68–79. https://doi.org/10.1016/j.gloenvcha.2014.10.012.

Drews, S., van den Bergh, J.C.J.M., 2016. What explains public support for climate policies? a review of empirical and experimental studies. Clim. Pol. 16 (7), 855–876. https://doi.org/10.1080/14693062.2015.1058240.

Ejelöv, E., Nilsson, A., 2020. Individual Factors Influencing Acceptability for Environmental policies: a review and research agenda. Sustainability [online] 12 (6). Available at.

Eliasson, J., Jonsson, L., 2011. The unexpected "yes": Explanatory factors behind the positive attitudes to congestion charges in Stockholm. Transp. Policy 18 (4), 636–647. https://doi.org/10.1016/j.tranpol.2011.03.006.

Eriksson, L., Garvill, J., Nordlund, A.M., 2006. Acceptability of travel demand management measures: the importance of problem awareness, personal norm, freedom, and fairness. J. Environ. Psychol. 26 (1), 15–26. https://doi.org/10.1016/j.jenvp.2006.05.003.

Field, A., Wild, K., Woodward, A., Macmillan, A., Mackie, H., 2018. Encountering bikelash: experiences and lessons from New Zealand communities. J. Transp. Health 11, 130–140. https://doi.org/10.1016/j.jth.2018.10.003.

Flynn, T.N., Marley, A.A.J., 2014. Chapter 8: best worst scaling: theory and methods. In: Hess, S., Daly, A. (Eds.), Handbook of Choice Modelling. Edward Elgar, Cheltenham, pp. 178–201.

Fujii, S., Gärling, T., Jakobsson, C., Jou, R.-C., 2004. A cross-country study of fairness and infringement on freedom as determinants of car owners' acceptance of road pricing. Transportation 31 (3), 285–295. https://doi.org/10.1023/B:PORT.0000025395.17250.49.

Furness, Z., 2010. One less Car : Bicycling and the politics of Automobility. Temple University Press, Philadelphia.

Gärling, T., Schuitema, G., 2007. Travel demand management targeting reduced private car use: effectiveness, public acceptability and political feasibility. J. Soc. Issues 63 (1), 139–153. https://doi.org/10.1111/j.1540-4560.2007.00500.x.

Giordano, C., 2021. What's the problem with pop-up cycle lanes? Independent. Available at: https://www.independent.co.uk/news/uk/home-news/cycle-lanes-pop-up-coronavirus-b1770421.html Accessed: 29/05/2025.

Goetting, K., Jarass, J., Nathanail, E.G., Adamos, G., Gavanas, N., 2023. How is the redesign of public space for active mobility and healthy neighborhoods perceived and accepted? Experiences from a temporary real-world experiment in Berlin. In: Nathanail, E.G. (Ed.), Smart Energy for Smart Transport. Springer, Switzerland, pp. 701–713.

Gössling, S., 2022. Extending the theoretical grounding of mobilities research: transport psychology perspectives. Mobilities 18 (2), 167–183. https://doi.org/10.1080/17450101.2022.2092886.

Gössling, S., Cohen, S., 2014. Why sustainable transport policies will fail: EU climate policy in the light of transport taboos. J. Transp. Geogr. 39, 197–207. https://doi.org/10.1016/j.jtrangeo.2014.07.010.

Gundlach, A., Ehrlinspiel, M., Kirsch, S., Koschker, A., Sagebiel, J., 2018. Investigating people's preferences for car-free city centers: a discrete choice experiment. Transp. Res. Part D: Transp. Environ. 63, 677–688. https://doi.org/10.1016/j.trd.2018.07.004.

Hensher, D.A., Bradley, M., 1993. Using stated response choice data to enrich revealed preference discrete choice models. Mark. Lett. 4 (2), 139–151. https://doi.org/10.1007/BF00994072.

Hess, S., Palma, D., 2019. Apollo: a flexible, powerful and customisable freeware package for choice model estimation and application. J. Choice Modell. 32, 100170. https://doi.org/10.1016/j.jocm.2019.100170.

Hess, S., Train, K.E., Polak, J.W., 2006. On the use of a Modified Latin Hypercube Sampling (MLHS) method in the estimation of a mixed Logit Model for vehicle choice. Transp. Res. B Methodol. 40 (2), 147–163. https://doi.org/10.1016/j.trb.2004.10.005.

Hoekstra, A.T.G., Twisk, D.A.M., Hagenzieker, M.P., 2018. Do road user roles serve as social identities? Differences between self-described cyclists and car drivers. Transport. Res. F: Traffic Psychol. Behav. 59, 365–377. https://doi.org/10.1016/j.trf.2018.09.006.

Hymas, C., 2023. Public turns against low traffic neighbourhoods as 'anti-car lobby' penalises drivers. Telegraph. Available at: https://www.telegraph.co.uk/news/2023/05/20/low-traffic-neighbourhoods-ltn-public-opposition/ [Accessed: 22/05/2025].

Jou, R.-C., Chen, C.-C., Chen, Y.-L., 2011. The effects of travellers' acceptance/satisfaction of unimplemented/implemented transportation demand management strategies on travel behaviour. Transportmetrica 7 (3), 201–228. https://doi.org/10.1080/18128600903421424.

Louviere, J.J., Flynn, T.N., Marley, A.A.J., 2015. Best-Worst Scaling: Theory, Methods and Applications. Cambridge University Press, Cambridge.

Loyola, M., Nelson, J.D., Clifton, G., Levinson, D., 2023. The influence of cycle lanes on road users' perception of road space. Urban Plann. Transport Res. 11 (1). https://doi.org/10.1080/21650020.2023.2195894.

Marcheschi, E., Vogel, N., Larsson, A., Perander, S., Koglin, T., 2022. Residents' acceptance towards car-free street experiments: Focus on perceived quality of life and neighborhood attachment. Transp. Res. Interdiscip. Perspect. 14, 100585. https://doi.org/10.1016/j.trip.2022.100585.

Markson, T., 2021. Hundreds sign petition opposing cycle lanes near Royal Berkshire Hospital. Reading Chron. Available at: https://www.readingchronicle.co.uk/news/19143820.hundreds-sign-petition-opposing-cycle-lanes-near-royal-berkshire-hospital/ [Accessed: 29/05/2025].

Marley, A.A.J., Louviere, J.J., 2005. Some probabilistic models of best, worst, and best–worst choices. J. Math. Psychol. 49 (6), 464–480. https://doi.org/10.1016/j.jmp.2005.05.003.

Mattioli, G., Roberts, C., Steinberger, J.K., Brown, A., 2020. The political economy of car dependence: a systems of provision approach. Energy Res. Soc. Sci. 66, 101486. https://doi.org/10.1016/j.erss.2020.101486.

Monsere, C., Dill, J., McNeil, N., Clifton, K. J. and Foster, N. (2014). *Lessons from the Green Lanes: Evaluating Protected Bike Lanes in the U.S.* Available at: https://pdxscholar.library.pdx.edu/cgi/viewcontent.cgi?article=1143&context=cengin_fac [Accessed: 22/05/2025].

Monsere, C.M., McNeil, N.W., Sanders, R.L., 2020. User-rated comfort and preference of separated bike lane intersection designs. Transp. Res. Rec. 2674 (9), 216–229. https://doi.org/10.1177/0361198120927694.

Murtagh, N., Gatersleben, B., Uzzell, D., 2012. Self-identity threat and resistance to change: evidence from regular travel behaviour. J. Environ. Psychol. 32 (4), 318–326. https://doi.org/10.1016/j.jenvp.2012.05.008.

Nello-Deakin, S., Sancho Vallvé, C., Sila Akinci, Z., 2024. Who's afraid of pedestrianisation? Residents' perceptions and preferences on street transformation. Habitat Int. 150, 103117. https://doi.org/10.1016/j.habitatint.2024.103117.

Nikitas, A., Tsigdinos, S., Karolemeas, C., Kourmpa, E., Bakogiannis, E., 2021. Cycling in the era of Covid-19: Lessons learnt and best practice policy recommendations for a more bike-centric future. Sustainability 13 (9), 4620. https://doi.org/10.3390/su13094620.

Noland, R.B., Iacobucci, E., Zhang, W., 2023. Public views on the reallocation of street space due to COVID-19. J. Am. Plann. Assoc. 89 (1), 93–106. https://doi.org/10.1080/01944363.2022.2058595.

Norton, P.D., 2007. Street rivals: jaywalking and the invention of the motor age street. Technol. Cult. 48 (2), 331–359. https://doi.org/10.1353/tech.2007.0085.

O'Grady, T. (2020). NIMBYism as Place-Protective Action: The Politics of Housebuilding. Available at: doi:10.31235/osf.io/d6pzy [Accessed: 24/05/2025].

ONS (2022a). *Ethics group, England and Wales: Census 2021. Office for National Statistics*. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/culturalidentity/ethnicity/bulletins/ethnicgroupenglandandwales/census2021 [Accessed: 31/07/2025].

ONS (2022b). *Population and household estimates, England and Wales: Census 2021. Office for National Statistics*. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/populationandhouseholdestimatesenglandandwales/census2021 [Accessed: 31/07/2025].

Poortinga, W., 2025. The role of policy appraisals and second-order beliefs in public support for climate policies in the UK. Clim. Pol. 1–15. https://doi.org/10.1080/14693062.2025.2539977.

Poortinga, W., Whitmarsh, L., Steentjes, K., Gray, E., Thompson, S., Brisley, R., 2023. Factors and framing effects in support for net zero policies in the United Kingdom. Front. Psychol. 14. https://doi.org/10.3389/fpsyg.2023.1287188.

Portsmouth City Council (2020). *Trial Cycle Lane to Be Removed*. Available at: https://travel.portsmouth.gov.uk/schemes/elm-grove-and-kings-road-cycle-lane/ [Accessed: 22/05/2025].

Potoglou, D., Burge, P., Flynn, T., Netten, A., Malley, J., Forder, J., Brazier, J.E., 2011. Best–worst scaling vs. discrete choice experiments: an empirical comparison using social care data. Soc. Sci. Med. 72 (10), 1717–1727. https://doi.org/10.1016/j.socscimed.2011.03.027.

Poudel, N., Singleton, P.A., 2022. Preferences for roundabout attributes among US bicyclists: a discrete choice experiment. Transp. Res. A Policy Pract. 155, 316–329. https://doi.org/10.1016/j.tra.2021.11.023.

Raymond, C.M., Brown, G., Weber, D., 2010. The measurement of place attachment: personal, community, and environmental connections. J. Environ. Psychol. 30 (4), 422–434. https://doi.org/10.1016/j.jenvp.2010.08.002.

Rissel, C., Crane, M., Standen, C., Wen, L.M., Ellison, R., Greaves, S., 2018. Public support for bicycling and transport policies in inner Sydney, Australia: a cross-sectional survey. Aust. N. Z. J. Public Health 42 (3), 309–314. https://doi.org/10.1111/1753-6405.12791.

Sanders, R.L., 2016. We can all get along: the alignment of driver and bicyclist roadway design preferences in the San Francisco Bay Area. Transp. Res. A Policy Pract. 91, 120–133. https://doi.org/10.1016/j.tra.2016.06.002.

Sanders, R.L., Judelman, B., 2018. Perceived safety and separated Bike lanes in the Midwest: results from a roadway design survey in Michigan. Transp. Res. Rec. 2672 (36), 1–11. https://doi.org/10.1177/0361198118758395.

Scannell, L., Gifford, R., 2010. Defining place attachment: a tripartite organizing framework. J. Environ. Psychol. 30 (1), 1–10. https://doi.org/10.1016/j.jenvp.2009.09.006.

Schade, J., Schlag, B., 2003. Acceptability of urban transport pricing strategies. Transport. Res. F: Traffic Psychol. Behav. 6 (1), 45–61. https://doi.org/10.1016/S1369-8478(02)00046-3.

Schiller, P.L., Kenworthy, J., 2017. An Introduction to Sustainable Transportation : Policy, Planning and Implementation, second ed. Routlefge, London.

Schmitz, S., Becker, S., Weiand, L., Niehoff, N., Schwartzbach, F., von Schneidemesser, E., 2019. Determinants of public acceptance for traffic-reducing policies to improve urban air quality. Sustainability 11 (14), 3991. https://doi.org/10.3390/su11143991.

Steg, L., Vlek, C., Slotegraaf, G., 2001. Instrumental-reasoned and symbolic-affective motives for using a motor car. Transport. Res. F: Traffic Psychol. Behav. 4 (3), 151–169. https://doi.org/10.1016/S1369-8478(01)00020-1.

Sztabinski, F. (2009). Bike lanes, on-street parking and business: a study of Bloor Street in Toronto's Annex neighborhood. Available at: https://www.tcat.ca/wp-content/uploads/2017/12/BikeLanes_ParkingandBusiness_Year1Report_Feb2009_Final_NewCover.pdf [Accessed: 25/03/2025].

Tajfel, H., Turner, J., 1979. An integrative theory of intergroup conflict. In: Austin, W.G., Worchel, S. (Eds.), The Social Psychology of Intergroup Relations. Monterey, Brooks/Cole, pp. 33–37.

Tilahun, N.Y., Levinson, D.M., Krizek, K.J., 2007. Trails, lanes, or traffic: Valuing bicycle facilities with an adaptive stated preference survey. Transp. Res. A Policy Pract. 41 (4), 287–301. https://doi.org/10.1016/j.tra.2006.09.007.

Timmons, S., Andersson, Y., McGowan, F., Lunn, P., 2024. Active travel infrastructure design and implementation: insights from behavioral science. WIREs Clim. Change 15 (3), e878. https://doi.org/10.1002/wcc.878.

Train, K., 2009. Discrete Choice Methods with simulation, second ed. Cambridge University Press, Cambridge.

Tzamourani, E., Tzouras, P.G., Tsigdinos, S., Kosmidis, I., Kepaptsoglou, K., 2023. Exploring the social acceptance of transforming urban arterials to multimodal corridors. The case of Panepistimiou Avenue in Athens. Int. J. Sustain. Transp. 17 (4), 333–347. https://doi.org/10.1080/15568318.2022.2037793.

Urry, J., 2004. The ‘System’ of Automobility. Theory Cult. Soc. 21 (4–5), 25–39. https://doi.org/10.1177/0263276404046059.

Vorkinn, M., Riese, H., 2001. Environmental concern in a local context: the significance of place attachment. Environ. Behav. 33 (2), 249–263. https://doi.org/10.1177/00139160121972972.

Walker, I., Tapp, A., Davis, A., 2023. Motonormativity: how social norms hide a major public health hazard. Int. J. Environ. Health 11 (1), 21–33. https://doi.org/10.1504/IJENVH.2023.135446.

Walker, P. (2021). *London council to step up security as vandals target low-traffic zones*. Available at: https://www.theguardian.com/uk-news/2021/jul/19/london-council-step-up-security-vandals-target-low-traffic-zones [Accessed: 22/05/2025].

Wang, L., 2018. Barriers to implementing pro-cycling policies: a case study of Hamburg. Sustainability 10 (11), 4196. https://doi.org/10.3390/su10114196.

Wild, K., Woodward, A., Field, A., Macmillan, A., 2018. Beyond ’bikelash’: engaging with community opposition to cycle lanes. Mobilities 13 (4), 505–519. https://doi.org/10.1080/17450101.2017.1408950.