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Review

Why Do They Ride with Others? Meta-Analysis of Factors Influencing Travelers to Carpool

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Abstract: Carpooling can be viewed as a simple intervention to reduce congestion, environmental problems, and land use for parking spaces. The present study assembled 18 studies on carpooling from all over the world that were published during the last five years (2014–2018) for a meta-analysis. By calculating effect sizes of 20 different factors, the study aimed to understand user characteristics, motives, and barriers to carpooling, and to gain insights about carpool interventions. Our results indicate that carpooling is very weakly related to socio-demographic variables, and that psychological factors are becoming more important, including monetary and time benefits, reducing congestion, and environmental concerns. Policy-makers can increase carpooling by offering cheaper parking or special parking spaces for carpoolers and introducing high-occupancy vehicle (HOV) lanes. Not surprisingly, fuel prices influence mode choice. The overall findings support previous results, but we found judgmental factors becoming more important for the choice to carpool. We conclude that carpooling services still fail to include many potential users and to serve users adequately. The challenge of meeting the needs of all users requires new approaches to designing carpool concepts, systems, and encounters.

Keywords: behavior; carpool; effect size; intervention; motivation; meta-analysis

1. Introduction

Congestion, noise, wasting scarce resources, and the deterioration of air quality are only a few of the challenges facing the transportation sector [1]. Nevertheless, a shift toward forms other than the car is not always the best solution. For example, public transport is not sustainable if occupancy is low [2]. Hence, to make better use of the transportation facilities and resources, increasing carpooling is a common intervention and strategy of planners and policy-makers [3].

Carpooling refers to the situation where two or more individuals travel in the same car to reduce the number of single-occupancy vehicles on the road [4]. It allows individuals to have the flexibility and speed of private cars, but with reduced costs and an ecological footprint for travelers and the society [5]. According to the United States Environmental Protection Agency [6], employees can benefit from cost reduction, time savings, socializing effects, and an increased value of time (e.g., sleeping or reading while commuting), whereas employers profit from a reduced need for parking spaces and employees who are less stressed from commuting. In addition, little public investment is required because carpooling uses the existing infrastructure [7].

Whether people carpool depends on their circumstances, attitudes, and demographics. A meta-analysis by Neoh et al. [4] summarized the key factors that influence a commuter's decision to carpool and their effect sizes, and offered policy recommendations to improve carpool participation. That study classified the main variables that influence carpooling into internal (e.g., demographic and judgmental factors) and external factors (e.g., third-party interventions and situational factors).

That paper analyzed studies published in or before 2013. Since then, new technologies and innovations emerged and the "sharing-economy" is on the rise [8]. Changes in society and technology require changes in policy recommendations to adapt to current trends. Therefore, a new meta-analysis was conducted to obtain the latest information about the key factors that influence carpooling. The overall purpose of this study is to demonstrate the decision criteria of importance for behavioral changes. Thus, the first question posed by this study is the same one posed by Neoh et al. [4]: *What are the key factors influencing the commuter's decision to participate in a non-household carpool, and their effect sizes?*

The present study poses this additional research question: *What are the main differences between the key factors influencing the commuter's decisions in comparison to articles before 2014?*

The reader might reasonably ask the following question: What is the "added value" of the current paper? Firstly, it presents new knowledge about carpooling and focuses on the key factors that influence the commuter's motivation to carpool, and explores recent trends, for instance, how connectivity and sharing may influence user characteristics and motivate carpooling. Secondly, it provides a solid basis for making policy recommendations and proposes scientifically based ideas about possible interventions to increase carpooling.

Section 2 provides a short literature review that defines the concept of carpooling, presents a brief history of carpooling, and summarizes the findings of the Neoh et al. [4] meta-analysis. The next section describes the most important aspects of meta-analysis, and the procedure used to gather relevant articles. This section is followed by the results, which includes the calculation of effect sizes. Section 5 further analyzes the data and compares the results of the two meta-analyses with a focus on policy. The last section suggests many possibilities for future avenues of research.

2. Literature Review

2.1. Definitions of Carpool Terms

Carpooling is defined differently by different authors. However, agreement can be found in the following definition, in which carpooling is "*an arrangement where two or more people* [. . .] *share the use of a privately owned car for a trip (or part of a trip), and the passengers contribute to the driver's expenses*" [9] (p. 2).

In its simplest form, carpooling entails a driver and passenger who share the same origin and destination for the journey. The arrangement gets more complex when the driver has to drop off the passenger at a different location. The most complex form is when the driver picks up and drops off the passenger at a pre-arranged location. This leads to detours, and increased travel time and distance [4]. Therefore, it is assumed that more complicated carpooling forms are used for longer travel distances to compensate for the time-loss. Common reasons to carpool in order of relevance are shopping, leisure activities, work and school commuting, other business trips, and picking up children. However, the longest carpool trips are usually work-related [9].

The term car sharing must be distinguished from carpooling, even though they are often used interchangeably in everyday language. Millard-Ball et al. [10] (p. 1) defines car sharing as "*an access to a fleet of vehicles on an hourly basis*" for car-sharing members. In comparison to carpooling, the vehicles are not privately owned and the users usually travel alone in the car, even though carpooling in a car-sharing context is not excluded [11]. The aim of car sharing is to reduce the burden of car ownership without limiting car accessibility.

A further distinction has to be made between on-demand economy services and sharing economy services. Companies such as Uber and Lyft offer taxi-like services performed by private individuals. However, the trips would not take place if customers did not order them. Hence, companies often call these trips ride-hailing instead of ridesharing [12]. This term and related studies were excluded from the literature search for the present meta-analysis.

"Slugging" and hitchhiking are not used synonymously with carpooling, even though they belong to the category of informal carpooling [13]. Both terms refer to a person waiting at the roadside hoping to be picked-up, with the first term being more common in United States (US) papers and hitchhiking being more common in European papers. In contrast to the general definition of carpool, these forms of traveling do not imply splitting the costs.

The terms lift sharing, ridesharing, and motor pooling are used as synonyms for carpooling. A Google Scholar search indicated the term carpooling (also carpool) is the most commonly used term in the literature, followed by ridesharing. A literature search also found that ridesharing is a more technically oriented term that covers the optimization of ridesharing systems, traffic assignment models, and algorithms for dynamic ridesharing. Ridesharing often implies the use of a mobile-phone application. This type of carpooling is also called dynamic carpooling in the literature [13]. Lift sharing and motor pooling are less common terms in the literature. Vanpooling follows the same principle as carpooling, but with larger cars, often organized for the employees of a company. A more detailed account of definitions of ridesharing terms can be found in Chen and Shaheen [14].

For the purpose of this study, we define a carpool as an arrangement between at least two individuals, traveling together in a private vehicle and splitting the travel costs.

2.2. A Short History of Carpooling

The term carpooling became popular in the 1970s as a behavioral response to the oil crisis. However, it dates further back in time. At the beginning of World War 1, when the US was falling into a recession, car owners began to offer seats in their cars. This was only a short-lived success story, as car manufacturers effectively lobbied for new policies, which eventually resulted in a 90% reduction in carpools. The number of carpools remained small until World War 2, when people were encouraged to take passengers in the car by the campaign slogan "when you ride alone, you ride with Hitler". Remarkably, it was the oil and car industries that promoted carpooling. After World War 2, carpooling declined again, but received new attention during the first and second oil crises [15]. However, carpooling decreased from 19.7% of all US work trips in 1980 to 13.4% in 1990 [16].

The rise in oil prices (2005) and the financial crisis (2008) led again to an increase in carpooling [15]. At the same time, with "*the advent of the internet, a number of private matching agencies emerged to provide diverse ridesharing services for travelers*" [5] (p. 29). However, internet-based matching platforms did not dramatically change travelers' mode choice of carpooling, and carpooling was again in decline. The reasons for the decline can be found in factors making it cheaper to travel by car to work (e.g., subsidized parking) and increased convenience resulting from highway extensions. More flexible work hours and telecommuting also contributed to the decline in carpooling [17].

The internet and mobile-phone applications, however, provide an opportunity to promote carpooling [8]. Companies such as BlaBlaCar, Zimride, and Lyftshare are accelerating the market [17]. The ease of requesting a ride with a mobile-phone application made ridesharing more attractive again. Platform-based organizations facilitate rapid market-spread, which enables them to reach a greater number of users and make more matches possible [18].

Another window of opportunity lies in societal change, and the sharing economy is becoming increasingly important in different business sectors. Companies such as Airbnb, eBay, and Uber are just a few examples. The popular slogan is "sharing is the new buying". This trend is also recognizable in the transportation sector. Car sharing and ridesharing are especially "trendy" in urban areas.

2.3. Carpooling Factors

The findings of Neoh et al. [4] provided an overview of the effect sizes of carpooling before 2014. They described two internal factors (*demographic factors* and *judgmental factors*) and two external factors (*third-party interventions* and *situational factors*). The results of these four categories are described in this section and used later in our meta-analysis.

2.3.1. Socio-Demographic Factors (Internal)

Socio-demographic factors, such as age, gender, and income, do not typically influence mode choice or a specific environmental behavior [19], and, as expected, Neoh et al. [4] found no major effects of demographic factors on carpooling. Nevertheless, the analysis showed that women were slightly more likely to carpool than men were. Age appeared to have no effect on carpooling, whereas income, marital status, and number of household members were found to have small effect sizes, indicating that other variables were more important for making a decision to carpool.

2.3.2. Judgmental Factors (Internal)

The research literature shows that psychological factors, also called judgmental factors, are more important than demographic factors in decision-making. Attitudes and norms tend to have the most influence when choosing a mode [19,20], such as convenience, commuter attitudes, socializing, and privacy. Other motivators are saving costs, reducing congestion, and living in a more environmentally friendly way. A few papers attempted to explain carpooling with a behavioral change theory (e.g., theory of reasoned action and theory of planned behavior), including an older paper by Ozanne and Mollenkopf [21], a thesis written in Chinese by Yang [22], and a recent paper by Bachmann et al. [23]. Hence, we identified a gap in the literature linking carpooling to psychological theories. The concept that attitudes have a strong influence on ridesharing was demonstrated by a study of Amirkiaee and Evangelopoulos [8]. Neoh et al. [4] found that judgmental factors, such as saving money, reliability, and the desire to reduce congestion, all had small effect sizes, but the effect was the desire to reduce congestion.

2.3.3. Interventions (External)

Carpool incentive programs include a variety of means to encourage carpooling. Possible work-place incentives are, for example, reduced parking costs, free parking, preferred parking, or reward programs to carpool.

It can be said, in regard to third-party interventions, that "sticks" (punishments) are more effective for motivating carpooling than "carrots" (rewards). However, reward measures are politically preferred by policy-makers [4,24], and other research showed that rewards are more effective, as they have greater acceptance and are perceived as "fair" [25].

According to Neoh et al. [4], reserved parking and high-occupancy vehicle (HOV) lanes increase the likelihood that people will carpool. The research showed that partner-matching programs increase the number of carpoolers, but people are skeptical of the effectiveness of these platforms before their implementation. Other interventions (e.g., parking costs, cost subsidies, or a guaranteed ride home) were found to have small effect sizes.

2.3.4. Situational Factors (External)

Summarizing the situational factors, carpooling is found to be attractive when access to public transport is low. However, Neoh et al. [4] found the effects of distance were inconsistent in the literature. While some authors reported that longer distances encourage carpooling (e.g., References [26,27]), others reported it did not influence mode choice (e.g., Reference [9]), or even discouraged people from carpooling [28].

The largest effect size in the meta-analysis of Neoh et al. [4] was related to employer size. No explanation for this was found by the meta-analysis; however, large employers often have greater pools of employees, which increases the possibility of matching carpooling partners [29], or they may have their own carpooling platforms. Furthermore, they are more likely to have employees working in shifts, which goes hand-in-hand with fixed work schedules. Moderate effects were observed for travel costs, work schedules, and living in urban areas. Small effect sizes included the controversial commuting distance effect, time of commuting, and population density [4].

3. Methodology

3.1. Meta-Analysis

Different outcome studies are statistically aggregated in a meta-analysis to determine overall effects [30]. Although a few studies may report an effect is significant, aggregated data use the statistical probabilities from larger samples, as summarized by Fisher 1944 (cited in Reference [30]). This also reduces over-interpretation of differences within single studies, as the method uses means across studies. Meta-analysis uses quantitative empirical studies that measure similar constructs and relationships. Another advantage is that a meta-analysis can handle everything ranging from a small to a large number of studies. A meta-analysis presents findings in a more sophisticated manner in comparison to conventional literature reviews [30].

The dependent variable in a meta-analysis is the effect size (e.g., mean differences, correlation coefficients, or odds ratios). The effect size is a value that "*reflects the magnitude of the treatment effect or (more generally) the strength of a relationship between two variables*" [31]. Effect sizes allow findings to be standardized across different empirical studies and can be directly compared [30]. Not only can the effect of an intervention be measured, but also any relationships between two variables, such as the use of carpooling by males compared to females [31].

Meta-analysis also has some shortcomings that need to be addressed. For example, it can sometimes compare "apples and oranges", as the studies are done under different circumstances (e.g., countries, sample sizes, populations, and methods of data acquisition). Therefore, it does not conclude that individual studies are wrong, but gives an overview of the means of the different outcomes. The collection of articles, furthermore, are at risk for selection bias [30]. It is, therefore, necessary to set clear boundaries and criteria for the inclusion of studies in a meta-analysis. Significant research findings are more likely to be published, whereas non-significant findings are rarely published. This leads again to a biased result [32] that one should be aware of when interpreting the findings.

3.2. Literature Search Procedure

The studies included in the present meta-analysis met the criteria used in the Neoh et al. [4] paper. The reports contained either (1) a carpooling intervention, (2) a behavioral change measure, or (3) a measure of carpooling preferences. Articles older than 2014 were excluded from the literature search, as they were already covered in the study by Neoh et al. [4].

The search for studies was conducted in several online libraries and databases, which cover the majority of the transportation research literature (Figure 1). Only articles that had carpooling, lift sharing, ridesharing, motor pooling, or vanpooling (search criteria: ((TitleCombined:(car*pool*)) OR (TitleCombined:(lift*shar*)) OR (TitleCombined:(ride*shar*)) OR (TitleCombined:(motor*pool*)) OR (TitleCombined:(van*pool*))) in the title were included in the literature search. A filter for year of publication was used to exclude articles older than 2014. The first search, which filtered for scientific papers by year and title, identified 243, after removing duplicates. Initial screening of the titles eliminated 150 articles. Most articles that were not relevant dealt with the technology behind carpooling, infrastructure needs, traffic safety (e.g., influence of drug use on carpooling) or included taxi-like services, which did not fit our definition of carpooling, were not included. After reading the abstracts of the 92 remaining articles, 45 articles were retained. Most of these articles did not look at carpool users and their behavior, but used computer simulations of carpooling, so they were eliminated. The remaining 45 articles were read to see if they met the criteria and whether they used measures that could be calculated as effect sizes to describe variables of importance. Twelve of these 45 articles were retained for analysis (Table 1). As a Google Scholar search cannot be filtered using the same criteria, a separate Google Scholar search was conducted to identify others articles. This resulted in three relevant articles that were added to the sample. Two more article that were found at a later stage were also added to the sample. The final sample for analysis consisted of 17 articles containing 18 studies.

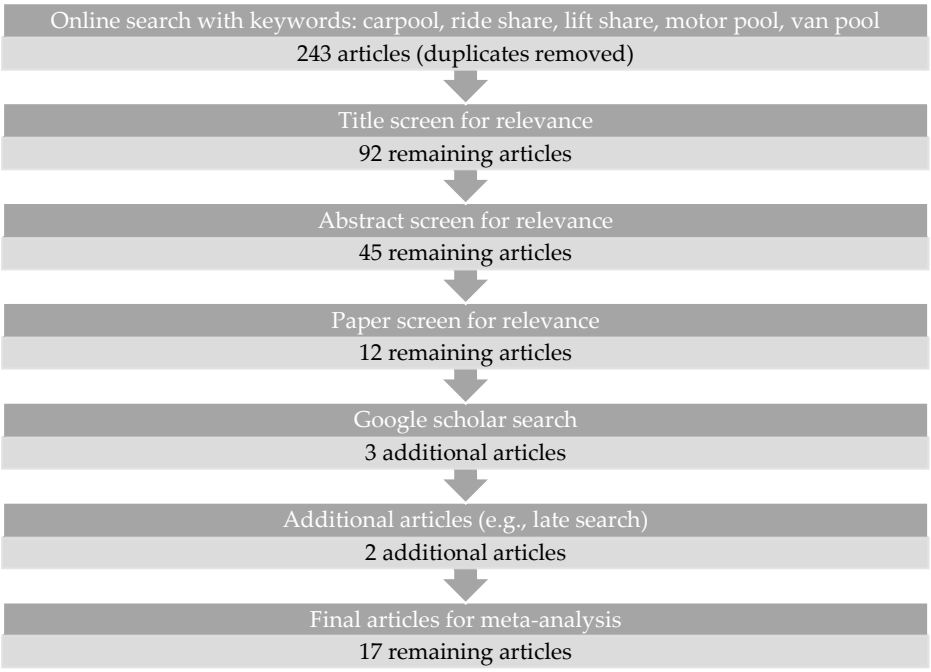

Figure 1. Literature search process.

The 17 articles were ordered alphabetically by the authors' last names, as listed in Table 1. The studies, which were published between 2014 and 2018, were fairly evenly distributed across years. The number of respondents (*N*) in the (travel) surveys or national statistics varied greatly across the studies. The smallest study sample had 51 observations (a comparison between the states in the US) and the largest samples came from national statistics that covered all residents. Most studies tried to understand the key motivators, the reasons for carpooling, and the characteristics of carpoolers. The methodology differed widely, although comparative analysis with a variety of modeling techniques is a common strategy when examining carpooling. The studies included samples from North America, Europe, and Asia, with the most studies (i.e., eight studies) conducted in the United States.

We realize the intention to perform a certain behavior is not the same as actually performing a behavior [33]. Nevertheless, due to the heterogeneity of the studies, we followed the principle of a mix of "oranges and apples" [34], and assumed, similar to motivational models, that there was no gap between motivation and behavior, or, in other words, that motivation can be used as a proxy for a behavior.

Table 1. Studies selected for the meta-analysis. USA—United States of America.

No.	Number in Reference List	Author (Year)	*N*	Study Objective	Methodology	Location
1.	[8]	Amirkiaee and Evangelopoulos (2018)	300	Examine the reasons to carpool	Experimental study (Partial Least Square Structural Equation Modelling)	USA
2.	[24]	Bachmann et al. (2018)	342	Examine carpool intention from psychological standpoint	Theory of planned behavior study (alpha reliabilities and zero-order correlations)	Switzerland
3.	[35]	Blumenberg and Smart (2014)	28,147	Examine immigrants' propensity to carpool	Travel survey data (multinomial logistic regression)	USA

Table 1. *Cont.*

No.	Number in Reference List	Author (Year)	*N*	Study Objective	Methodology	Location
4.	[11]	Delhomme and Gheorghiu (2016)	1207	Compare carpoolers with non-carpoolers to understand motivation and characteristics	Comparative study (test of differences)	France
5.	[9]	Gheorghiu and Delhomme (2018)	1207	Examine motivations underlying carpooling	Comparative study (stepwise regression)	France
6.	[36]	Javid, R., Nejat, and Hayhoe (2017) (Study 1)	51	Examine the impact of carpool interventions	Cross-sectional (multiple regression)	USA
7.	[36]	Javid, R., Nejat, and Hayhoe (2017) (Study 2)	58	Ibid.	Cross-sectional (propensity model)	USA
8.	[37]	Kesternich (2015)	201	Understand users' preference to examine the needs to attract more carpoolers	Comparative study (mean comparison)	Europe
9.	[38]	Lee et al. (2015)	1795	Examine carpooling potential in non-metropolitan areas	Comparative study (binomial logistic regression)	USA
10.	[39]	Lem (2014)	346	Examine the effect of carpooling interventions	Discrete choice analysis (multinomial logit model)	The Netherlands
11.	[40]	Liakopoulou et al. (2017)	455	Investigate preferences to create carpool system	Stated preferences (mean comparison)	Greece
12.	[41]	Malodia and Singla (2016)	106	Examine perception and evaluate preferences to carpool	Experimental, stated preferences (comparison of means)	India
13.	[42]	Neoh et al. (2018)	1028	Examine the motivation to carpool	Travel survey data (SEM)	USA
14.	[3]	Park et al. (2018)	1856	Examine factors affecting individuals' carpooling decisions and carpool role preferences	Travel pattern survey, role preferences (probit regression)	USA
15.	[43]	Shaheen et al. (2017)	618	Examine the characteristics of rideshare users in France	Carpool user survey (ordered logit regression)	France
16.	[28]	Tahmasseby et al. (2016)	210	Examine the potential for a social network peer-to-peer-based carpool system	Stated and revealed preference study (logit models)	Canada
17.	[44]	Van der Waerden et al. (2015)	354	Examine factors stimulating car drivers to change to carpooling for work trips	Stated choice experimental study (mixed multinomial logit model)	The Netherlands
18.	[45]	Zhang and Zhang (2018)	219,026	Examine carpooling preferences	Comparative study (zero-inflated models using national travel survey data)	USA

4. Results

Most of the effect-size factors used by Neoh et al. [4] were used herein to be able to compare the two analyses. However, the demographic factors *marital status* and *being a university student* were eliminated as they were not analyzed in the studies in Table 1. With regard to the judgmental factors, the recent studies focused more on the attitudes and values of the carpoolers than did studies published before 2014. Therefore, the factors *saving time*, *reduce environmental impacts*, *comfort*, *safety*, *socializing*, and *trust* were added to the list. The only incentive in the current sample was HOV lanes; therefore, interventions were grouped together with situational factors to calculate effect sizes. The factors *fixed*

work schedules. *number of employees*, and *living in an urban area* could not be used in our analysis, but the factor *fuel price* was included as a situational factor.

Table 2 represents all the effect sizes of the demographic factors, the judgmental factors, the incentives, and the situational factors. In total, the effect sizes of 20 factors were analyzed. Table 2 is organized as described below. The k stands for the number of studies that mention the effect size in question. All the effect sizes, which indicate the strength of a factor's influence on carpooling, are transformed into the correlation coefficient r, which allows direct comparisons with the meta-analysis by Neoh et al. [4]. In six studies, multiple regression analyses and standardized beta coefficients were reported instead of correlation coefficients. These were transformed to r as suggested by Peterson and Brown [46] using their imputation formula ($r = \beta + 0.05\lambda$), where $\lambda = 1$ when β is positive and $\lambda = 0$ when β is negative, to take into account the fact that non-negative β-values tend to be relatively smaller than their corresponding r values. We furthermore followed the advice of Polanin and Snilstveit [47] on how to convert an effect size into an r-value, and used the corresponding effect-size calculator [48] and the calculator on the Psychometrica website, which is based on Lenhard and Lenhard [49]. N represents the total sample of all the studies in k. The total effect size was calculated as follows (where n is the sample size of the study and r is the effect size within the study):

$$effect\ size = \frac{\sum_{i=1}^{k} n_i r_i}{\sum_{i=1}^{k} n_i}.$$

As the sample was 219,026 participants in the study by Zhang and Zhang [45] and 28,147 participants in the study by Blumenberg and Smart [35], they dominated the comparisons with the other studies in our meta-analysis. To assess the potential impact of these two large studies, additional effect size calculations were performed with these two samples excluded. The results are shown in Table 3, and discussed further in Section 5.

The variability of the mean effect sizes across studies is reported with confidence intervals (CIs), and the generalizability of individual effect sizes is measured by credibility variance (CrV) [4]. The confidence intervals and credibility variance are reported at the 95% level and the 80% level, respectively. If the upper and lower bounds of the confidence interval do not overlap with zero, one can draw conclusions with 95% confidence about the direction of the mean effect size. The factors meeting these criteria are underlined in Table 2. If the credibility variance is not zero, it means that 90% (80% + 10% at the top or bottom of the interval) of the effect sizes are in the same direction.

Based on a meta-analysis by Mehana and Reynolds [50] (p. 99), the CI was calculated with a "*two-tailed critical value of the normal distribution*", specifically by $CI^{95} = r \pm 1.96\left(\frac{\sigma}{\sqrt{k}}\right)$. The credibility variance was calculated by $CrV^{80} = r \pm 1.28\left(\frac{\sigma}{\sqrt{k}}\right)$.

We acknowledge that it is common to do a Q-test for a meta-analysis. However, the small number of studies makes the Q-test vulnerable. The results of the effect size and the confidence interval need to be interpreted with caution [51].

The last column of Table 2 shows the studies used to calculate the total effect size of the respective factors, according to the study number given in Table 1. A large effect size (r) is equal to a value greater than 0.37, a value above 0.24 is equal to a medium effect size, and a value larger than 0.10 corresponds to a small effect size. Values below 0.10 indicate a very weak or absent effect.

Table 2. Number of studies (*k*), sample size (*N*), calculated effect size, rank order of effect size, credibility variance (CV), and confidence interval (CI) of the included factors. HOV—high-occupancy vehicle.

	k	*N*	Effect Size	Rank Order	Lower CV	Upper CV	Lower CI	Upper CI	Studies from Table 1
Demographic Factors									
(1) Age	8	251,921	−0.02	19	−0.05	0.02	−0.07	0.04	2,3,4,5,10,13,15,18
(2) Female	9	254,202	−0.08	13	−0.12	−0.04	−0.14	−0.01	2,3,4,9,10,11,13,14,18
(3) Income	5	248,347	0.09	9	0.06	0.13	0.04	0.15	3,10,15,16,18
(4) Number of people in household	4	29,463	0.06	16	0.01	0.12	−0.03	0.15	3,4,6,7
(5) Number of cars in household	4	247,282	−0.08	11	−0.15	−0.01	−0.19	0.02	3,6,7,18
Judgmental Factors									
(1) Saving money	3	3264	0.10	8	0.04	0.17	0.00	0.20	4,8,14
(2) Reduce congestion	2	307	0.08	12	0.00	0.16	−0.04	0.20	8,12
(3) Reliability	3	806	0.05	17	−0.01	0.11	−0.05	0.14	10,12,17
(4) Saving time	5	3580	0.10	7	0.00	0.21	−0.05	0.26	4,8,12,14,16
(5) Environment/ Sustainability	5	3580	0.11	6	0.04	0.18	0.01	0.21	4,8,12,14,16
(6) Comfort	3	2520	−0.02	18	−0.21	0.16	−0.30	0.26	4,5,12
(7) Safety/Security	3	2520	−0.09	10	−0.17	−0.02	−0.21	0.02	4,5,12
(8) Socializing	2	1408	0.15	4	0.14	0.16	0.14	0.16	4,8
(9) Trust	3	843	0.07	14	0.03	0.11	0.01	0.13	1,2,8
Interventions/Situational Factors									
(1) HOV lane	2	109	0.46	1	0.38	0.53	0.35	0.57	6,7
(2) Commute distance	2	1417	0.07	15	−0.01	0.15	−0.05	0.20	4,16
(3) Time commuting	6	3811	0.12	5	0.06	0.17	0.03	0.20	5,6,7,9,10,17
(4) Population density (home)	3	248,380	0.17	2	0.11	0.22	0.07	0.26	3,4,18
(5) Fuel costs	2	109	0.16	3	0.00	0.33	−0.09	0.42	6,7

Table 3. Effect size calculations with the two largest studies removed (study 3 and 18) reported for the factors include in those two studies, adding the effect size change when excluding the large-sample studies.

	k	*N*	Effect Size	Effect Size Change	Lower CV	Upper CV	Lower CI	Upper CI	Studies from Table 1
Demographic Factors									
(1) Age	6	4748	−0.13	−0.11	−0.17	−0.09	−0.20	−0.06	2,4,5,10,13,15
(2) Female	7	7029	0.04	0.12	0.00	0.09	−0.03	0.12	2,4,9,10,11,13,14
(3) Income	3	1174	0.06	−0.03	0.01	0.10	−0.01	0.13	10,15,16
(4) Number of people in household	3	1316	0.13	0.07	0.07	0.19	0.04	0.22	4,6,7
(5) Number of cars in household	2	109	0.12	0.20	0.08	0.16	0.05	0.19	6,7

5. Results and Discussion

In this section, we describe the results of the key factors influencing commuters' decisions to participate in carpooling, and compare the effect sizes to those in the previous study by Neoh et al. [4]. Furthermore, we give policy advice in relation to each key factor.

5.1. Demographic Factors

As expected, in keeping with the findings of Lanzini and Khan [19] and Neoh et al. [4], demographic factors were rather limited in their effect sizes. None of the demographic variables that were examined showed a significant effect (i.e., effects were weaker than the threshold of being categorized as a small effect size), and they all had relatively low CI^{95} and CrV^{80} ranges. Excluding the two large-sample studies (see Table 3) led to three of the five demographic variables showing stronger effects, which were still small, but slightly above the threshold of being a small effect size.

Being female had an insignificant effect size ($r = -0.08$). It is, however, worth noting that it was strongly influenced by the large-sample studies, as the other papers all reported a positive, but limited, relationship between being female and carpooling. That men and women react differently to carpooling was also noted in the study by Lee et al. [38], which concluded that female travelers would be less likely to carpool if they were matched with strangers. However, gender effects do seem to be rather weak, regardless of including the large-sample studies or not. Weak and non-significant effects could also be observed for income, regardless of including or excluding the large-samples studies.

A similar negative effect was demonstrated for car ownership; the more cars there are in a household ($r = -0.08$), the less likely people are to carpool. However, the large CI^{95} and CrV^{80} ranges indicate that these results need to be viewed with caution. Indeed, when excluding the large-sample studies (Table 3), the effects changed to a significant small positive effect size ($r = 0.12$), indicating that, in some instances, more cars would lead to increased carpooling.

The number of people living in a household had a minimal, but positive effect size. This variable was, however, slightly stronger when excluding one of the large-sample studies. Sharing a car within a household is generally excluded from the definition of "carpooling". However, one would expect carpooling to be easier within the same household, as the starting point is the same.

For age, a small negative effect could only be observed when the two large studies were excluded, indicating that younger people carpool more often, but that it may be context-dependent.

5.2. Judgmental Factors

The two large-sample studies did not include any of the judgmental factors, whereby the results reported below only relate to Table 2. The judgmental factors showed larger effect sizes compared to the meta-analysis by Neoh et al. [4]. What we find is that more studies in the present meta-analysis focused on the impact of psychological factors, such as the awareness of sustainability, time savings, and socializing aspects of carpooling. This trend also follows the reasoning that psychological variables are easier to change than socio-demographic variables [33].

Socializing ($r = 0.15$), environmental concerns ($r = 0.11$), saving time ($r = 0.10$), and saving money ($r = 0.10$) all had small effects on carpooling. Even though the results reflect the findings of Neoh et al. [4], it is surprising that saving money and time do not have larger effect sizes, as would be assumed when looking at similar studies, such as the large analysis of Ciasullo et al. [13].

Surprisingly, reducing congestion showed a relatively small effect ($r = 0.08$). However, we only found two studies reporting the corresponding effect sizes, and they had relatively large CI^{95} and CrV^{80} values. We assume that this result largely depends on the traffic situation in the country or city where the study participants lived.

There were small negative effects of comfort ($r = -0.02$) and safety/security ($r = -0.09$). Even though their direction was the same, it should be mentioned that studies reporting results for these two factors did not reach consensus on the strength of the effect size, as can be seen in the range of confidence intervals and credibility variance: CI^{95} *Comfort* = −0.30/0.26, and CI^{95} *Safety/security* = −0.21/0.02.

Judgmental factors seem to be strongly dependent on country and culture. From the study in India, it is apparent that most judgmental factors have a large positive or negative effect; thus, they are more relevant there than they are in other countries. These results also reflect differences in economic situations and infrastructure.

When using judgmental factors (e.g., more environmentally friendly, safer, more comfort) to promote carpooling, it is crucial to attend to demographic characteristics. Thus, for example, the trust factor is more relevant for females than males [38]. Policy-makers and companies need to be aware that promotional efforts addressing the wrong target group can lead to a boomerang effect, which means that people may react in an opposite direction than anticipated, developing a more positive attitude toward single-occupancy car usage, as evident in other transportation studies [52].

5.3. (Policy) Interventions and Situational Factors

Many of the interventions (e.g., finding a potential partner, a cost subsidy, or a guaranteed ride home) described by Neoh et al. [4] could not be examined in our paper, as there were no numerical measures of interventions by which to calculate effect sizes. However, most of those reported showed effects.

A large effect was found for HOV lanes. The studies that reported an effect size for HOV lanes were all from the US, which may limit their generalizability to, for instance, the European transportation context, where HOV lanes are not as well known. It should also be noted that only two studies were identified that included this factor.

Situational factors are important for mode choice, especially fuel costs, which substantially influence people's choice to carpool. In our empirical material, only two studies were identified including fuel costs, one with a strong positive effect and one without effect, which makes it somewhat hard to draw any conclusions. However, effects of fuel prices are argued to exist and supported by historical trends of increased carpooling [15]; when fuel prices are high, carpooling increases, and, when prices are low, carpooling decreases. This trend can be explained by the fact that fuel prices are the main cost of driving a car, or at least the cost most visible to car owners.

Population density had a similar effect. The higher the density was, the more people carpooled. This result is not surprising, as carpooling in urban areas benefits from greater supply and greater demand within a small area (e.g., walking distance to the carpool location). Carpooling can potentially be a solution also for rural areas with fewer transportation alternatives, as public transportation connections are often unsatisfactory or the distances are too large for active modes (walking or bicycling). However, we still do not know if a lack of possibilities could be used as a factor to increase carpooling, or whether density acts as a barrier in rural areas.

A factor that speaks in favor of carpooling in rural areas is the result related to commute time, where we find a small positive effect indicating that longer commutes are related to more carpooling ($r = 0.12$).

Many situational factors are related to the workplace (e.g., distance to work, work flexibility). However, the value of carpooling should not be underestimated for non-work-related activities (e.g., grocery shopping and leisure activities), as some non-work activities are fixed in time (e.g., once a week) and place (e.g., the shopping center). Policy-makers should, thus, also focus on other non-work fixed activities to promote carpooling. Potential carpoolers could be more attracted by interventions if they were designed for carpooling as a second mode choice, instead of forcing users to carpool on a daily basis. A public transportation study found such a result, in which marketing material highlighted only specific situations where the bus could be more convenient than the car [52].

6. General Discussion

Our primary aim in the present study was to identify key factors influencing the commuter's decision to participate in carpooling. In agreement with Neoh et al. [4], we found that judgmental factors and external third-party interventions (e.g., situational factors) are still very important for an individual's decision to carpool or not. Our follow-up on carpooling research by Neoh et al. [4] confirms that demographic factors are limited in their effect sizes, but can influence judgmental factors, such as environmental awareness or safety and security.

Our meta-analysis shows that judgmental factors are becoming more important for mode choice, and are also becoming the focus of transportation research. However, our review of up-to-date research also points to conflicting results on judgmental factors, such as "comfort" and "safety/security". We conclude that carpooling services still fail to include many potential users and to serve users adequately. The challenge of meeting the needs of all users requires new approaches to designing carpool concepts, systems, and encounters. Service inclusion is a concept that can guide future developments in this area; a service should provide fair access to it, fair treatment during the service, and a fair opportunity to exit the service [53]. In order to attract more people to carpooling, research is

needed on how to design carpool interventions in a manner that promotes inclusion and permits users to experience the pleasure (e.g., satisfaction and wellbeing) of using carpool services. Many researchers mention and even argue, similar to our research, that carpooling is an alternative mode to public transport and active modes that can reduce environmental problems. However, this meta-analysis showed that people who carpool are not focused on improving the environment; rather, they want to socialize.

In addition to judgmental factors, there may very well be other psychological factors of importance for carpooling. The concept of stage of motivation or degree of intention for potential behavioral change could, for instance, be applied to determine how willing people are to use different types of carpool offerings (e.g., References [54,55]). It may then be possible to design and match interventions that attract different segments of people based on their stage of motivation to change. Factors which were examined by only a few studies (e.g., number of cars in a household, trust, or parking availability) should also receive more attention in future research.

Apart from internal factors (demographic factors and judgmental factors), Neoh et al. [4] concluded that external factors (third-party interventions and situational factors) are important for the success of carpooling. This was apparent in our analysis of the past five years of carpooling studies. As is clear from the results, travel demand management measures, such as HOV lanes, can facilitate the implementation and increase carpooling. Furthermore, our review shows how positive effects can be reached by intervening at the judgmental level by highlighting economic and environmental benefits to potential users. Even though their effect sizes were limited, they can help change the attitudes of travelers about carpooling, which can promote a change in travel behavior over time. By intervening on a judgmental level, one can reduce barriers to carpooling, such as lack of trust. Closed carpooling platforms (e.g., carpool offerings at companies or universities) can reduce lack of trust because people know each other or are part of a mutual community. Safety and security can, thus, be increased by matching people on such a social network. This is in line with the conclusion of a recent annotated review arguing that "stranger danger" is the most important barrier, that social factors assist in reducing this barrier, and that the unit of analysis, thus, should shift to focus more on the individual in a social context [56].

Barriers to leaving the car and shifting to sustainable modes are strong. In this meta-analysis, we identified a number of significant factors of relevance for carpooling. Compared to carpooling, public transport or active modes are, in most cases, even more sustainable. A problem for a shift toward more sustainable travel may be our complex needs of different mobility solutions for different purposes. A solution may be to integrate carpooling platforms into the mobility as a service (MaaS) concept, where travelers shift from privately owned vehicles to monthly subscriptions for mobility services. This integration would not replace the car completely, but offer multimodal transportation. Another recommendation is to implement carpooling where access to public transport is limited [57]. More experimentation is, however, needed for designing and testing different types of offerings, both for fixed activities and non-fixed (non-work) activities. In non-work-related activities, social interaction might be of greater interest.

The use of online platforms and applications increased in the last few years. However, this meta-analysis found few studies analyzing the effect of such platforms. Future research should focus on the effectiveness of different carpool platforms and analyze aspects of them in more detail (e.g., user friendliness and number of carpoolers). The first steps in this direction were made (e.g., References [28,38]; however, the reported results are not comparable to effect sizes. Another interesting aspect is the use of social media and its ability to function as a platform to match carpoolers, which is also interesting in that "socializing" has an effect on the intention to carpool. It was recently suggested that a new evolution in carpooling may be on the rise when (or if) automated vehicles are introduced at a large scale. Shaheen and Cohen [58] argue that many practitioners and researchers predict that, although highly uncertain, shared automated vehicles (SAV) will lead to greater affordability, increased efficiency, and less greenhouse gas emissions. The question still remains

how SAV will be perceived and accepted [59] from a user and non-user perspective, as well as the future demand of car sharing [60]. As Harper, Hendrickson, Mangones, and Samaras [61] noted, automated vehicles clearly have the potential to increase mobility and access for underserved groups (e.g., elderly and disabled), thereby also increasing their vehicle miles traveled. Whether future SAV will be used for carpooling by privately owned cars or in the form of service offerings by public transportation, taxi, or taxi-like services (e.g., Uber or Lyft) remains unknown.

We integrated results from different countries because of the small number of existing studies. Hence, this might have produced mixed results, as different infrastructures, policies, and cultures may affect carpooling differently. Carpooling activities, incentives, and interventions need to be adapted accordingly, and a closer examination of the research literature from similar regions/countries is recommended before implementing carpooling policies.

The greatest limitation of this study was the small number of the studies that could be used to calculate effect sizes, which ranged from two to nine studies. Thus, it may be a bit premature to interpret the results and the effect sizes as solid, as they may still be somewhat anecdotal in nature. However, the studies we selected for analysis had a large total sample size, which should be seen as a positive point [62]. The application of meta-analysis required the exclusion of articles that described factors that affected carpooling, but did not quantitatively present their results. Also, small or non-significant effect sizes may sometimes be ignored or not be reported. Hence, meta-analyses face the danger of being somewhat biased due to the published (and unpublished) studies. A small number of studies also face the risk of comparing "apples and oranges" in terms of, for instance, different outcomes (actual behavior vs. intention), different cultures, different methods to collect data, or different situational factors. In order to sustain reliability, it is necessary to set clear boundaries and criteria for the inclusion of studies in a meta-analysis, despite the risk of excluding some relevant study.

We are aware that there exist other forms of ridesharing that go beyond the definition employed by our meta-analysis. For instance, there is a body of literature on casual ridesharing, i.e., hitchhiking or slugging, where splitting the travel costs is not a necessity. We encourage future research to conduct a meta-analysis on recent studies in this domain, and to compare the outcomes with the results presented here. This would add valuable knowledge to the ongoing debate on the sharing economy concept.

Acknowledging these limitations, we do believe this meta-analysis provides important new knowledge about key judgmental and situational factors that should help transportation researchers navigate future investigations of carpooling. Our findings also provide additional insights to consider when designing future inclusive and pleasurable carpool offerings.

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References

1. Black, W.R. *Sustainable Transportation: Problems and Solutions*; Guilford Press: New York, NY, USA, 2010.
2. Gärling, T.; Ettema, D.; Friman, M. *Handbook of Sustainable Travel*; Springer Science & Business Media: New York, NY, USA, 2013.
3. Park, Y.; Chen, N.; Akar, G. Who is Interested in Carpooling and Why: The Importance of Individual Characteristics, Role Preferences and Carpool Markets. *Transp. Res. Rec.* **2018**. [CrossRef]
4. Neoh, J.G.; Chipulu, M.; Marshall, A. What encourages people to carpool? An evaluation of factors with meta-analysis. *Transportation* **2017**, *44*, 423–447. [CrossRef]
5. Furuhata, M.; Dessouky, M.; Ordóñez, F.; Brunet, M.-E.; Wang, X.; Koenig, S. Ridesharing: The state-of-the-art and future directions. *Transp. Res. Part B Methodol.* **2013**, *57*, 28–46. [CrossRef]

6. United States Environmental Protection Agency. *Carpool Incentive Programs: Implementing Commuter Benefits as One of the Nation's Best Workplaces for Commuters*; United States Environmental Protection Agency: Cincinnati, OH, USA, 2005.
7. Garrison, W.L.; Wellar, B.; MacKinnon, R.; Black, W.R.; Getis, A. Research Commentary: Increasing the Flexibility of Legacy Systems. *Int. J. Appl. Geospatial Res. IJAGR* **2011**, *2*, 39–55. [CrossRef]
8. Amirkiaee, S.Y.; Evangelopoulos, N. Why do people rideshare? An experimental study. *Transp. Res. Part F Traffic Psychol. Behav.* **2018**, *55*, 9–24. [CrossRef]
9. Gheorghiu, A.; Delhomme, P. For which types of trips do French drivers carpool? Motivations underlying carpooling for different types of trips. *Transp. Res. Part A Policy Pract.* **2018**, *113*, 460–475. [CrossRef]
10. Millard-Ball, A.; Murray, G.; Ter Schure, J.; Fox, C.; Burkhardt, J. *Car-Sharing: Where and How It Succeeds*; TCRP Report 108; Transportation Research Board: Washington, DC, USA, 2005.
11. Delhomme, P.; Gheorghiu, A. Comparing French carpoolers and non-carpoolers: Which factors contribute the most to carpooling? *Transp. Res. Part D Transp. Environ.* **2016**, *42*, 1–15. [CrossRef]
12. Frenken, K.; Schor, J. Putting the sharing economy into perspective. *Environ. Innov. Soc. Transit.* **2017**, *23*, 3–10. [CrossRef]
13. Ciasullo, M.V.; Troisi, O.; Loia, F.; Maione, G. Carpooling: Travelers' perceptions from a big data analysis. *TQM J.* **2018**, *30*, 554–571. [CrossRef]
14. Chan, N.D.; Shaheen, S.A. Ridesharing in North America: Past, Present, and Future. *Transp. Rev.* **2012**, *32*, 93–112. [CrossRef]
15. Cozza, J. The History of Carpooling, from Jitneys to Ridesharing. Shareable, 2012. Available online: https://www.shareable.net/blog/the-history-of-carpooling-from-jitneys-to-ridesharing (accessed on 16 June 2018).
16. Ferguson, E. The rise and fall of the American carpool: 1970–1990. *Transportation* **1997**, *24*, 349–376. [CrossRef]
17. Jaffe, E. Would You Consider Carpooling If Technology Made It Much, Much Easier? CityLab., 2015. Available online: http://www.citylab.com/commute/2015/03/carpooling-tries-for-a-comeback/388009/ (accessed on 15 July 2018).
18. Nicoll, E.; Armstrong, S. Ride-Sharing: The Rise of Innovative Transportation Services. MaRS, 2016. Available online: https://www.marsdd.com/news-and-insights/ride-sharing-the-rise-of-innovative-transportation-services/ (accessed on 15 July 2018).
19. Lanzini, P.; Khan, S.A. Shedding light on the psychological and behavioral determinants of travel mode choice: A meta-analysis. *Transp. Res. Part F Traffic Psychol. Behav.* **2017**, *48*, 13–27. [CrossRef]
20. Gardner, B.; Abraham, C. Psychological correlates of car use: A meta-analysis. *Transp. Res. Part F Traffic Psychol. Behav.* **2008**, *11*, 300–311. [CrossRef]
21. Ozanne, L.; Mollenkopf, D. Understanding consumer intentions to carpool: A test of alternative models. In Proceedings of the 1999 annual meeting of the Australian & New Zealand Marketing Academy, Sydney, Australia, 28 November–1 December 1999.
22. Yang, C. Predicting Intention to Travel by Carpool and Intention to Use Carpool Websites with TPB and TAM Respectively. Available online: http://etd.lib.nsysu.edu.tw/ETD-db/ETD-search/view_etd?URN=etd-0019116-212141 (accessed on 15 July 2018).
23. Bachmann, F.; Hanimann, A.; Artho, J.; Jonas, K. What drives people to carpool? Explaining carpooling intention from the perspectives of carpooling passengers and drivers. *Transp. Res. Part F Traffic Psychol. Behav.* **2018**, *59*, 260–268. [CrossRef]
24. Hwang, K.; Giuliano, G. *The Determinants of Ridesharing: Literature Review*; Working Paper UCTC, No. 38; University of California Transportation Center: Berkeley, CA, USA, 1990.
25. Eriksson, L.; Garvill, J.; Nordlund, A.M. Acceptability of single and combined transport policy measures: The importance of environmental and policy specific beliefs. *Transp. Res. Part A Policy Pract.* **2008**, *42*, 1117–1128. [CrossRef]
26. Jacobson, S.H.; King, D.M. Fuel saving and ridesharing in the US: Motivations, limitations, and opportunities. *Transp. Res. Part D Transp. Environ.* **2009**, *14*, 14–21. [CrossRef]
27. Tahmasseby, S.; Kattan, L.; Barbour, B. Propensity to participate in a peer-to-peer social-network-based carpooling system: Propensity to social-network-based carpooling. *J. Adv. Transp.* **2016**, *50*, 240–254. [CrossRef]
28. Cervero, R.; Griesenbeck, B. Factors influencing commuting choices in suburban labor markets: A case analysis of Pleasanton, California. *Transp. Res. Part A Gen.* **1988**, *22*, 151–161. [CrossRef]

29. Vanoutrive, T.; Van De Vijver, E.; Van Malderen, L.; Jourquin, B.; Thomas, I.; Verhetsel, A.; Witlox, F. What determines carpooling to workplaces in Belgium: Location, organisation, or promotion? *J. Transp. Geogr.* **2012**, *22*, 77–86. [CrossRef]
30. Wilson, D.B.; Lipsey, M.W. *Practical Meta-Analysis*; Sage: Thousand Oaks, CA, USA, 2001.
31. Borenstein, M.; Hedges, L.V.; Higgins, J.P.T.; Rothstein, H.R. *Introduction to Meta-Analysis*; John Wiley & Sons: Hoboken, NJ, USA, 2011.
32. Wolf, F.M. *Meta-Analysis: Quantitative Methods for Research Synthesis*; Sage: Thousand Oaks, CA, USA, 1986.
33. Armitage, C.J.; Conner, M. Social cognition models and health behaviour: A structured review. *Psychol. Health* **2000**, *15*, 173–189. [CrossRef]
34. Esteves, S.C.; Majzoub, A.; Agarwal, A. The problem of mixing "apples and oranges" in meta-analytic studies. *Transl. Androl. Urol.* **2017**, *6*, S412–S413. [CrossRef] [PubMed]
35. Blumenberg, E.; Smart, M. Brother can you Spare a Ride? Carpooling in Immigrant Neighbourhoods. *Urban Stud.* **2014**, *51*, 1871–1890. [CrossRef]
36. Javid, R.; Nejat, A.; Hayhoe, K. Quantifying the environmental impacts of increasing high occupancy vehicle lanes in the United States. *Transp. Res. Part D Transp. Environ.* **2017**, *56*, 155–174. [CrossRef]
37. Kesternich, E. What Factors Explain Carpoolers' Decision to Use Carpooling Matching Platforms?: A Survey-Based Observation of Carpooling Matching Platforms in Europe. Master's Thesis, University of Twente, Enschede, The Netherlands, 2015.
38. Lee, B.H.-Y.; Aultman-Hall, L.; Coogan, M.; Adler, T. Rideshare mode potential in non-metropolitan areas of the northeastern United States. *J. Transp. Land Use* **2015**, *9*. [CrossRef]
39. Lem, A.A. *Motivating City-Commuters to Carpool*; Eindhoven University of Technology: Eindhoven, The Netherlands, 2014.
40. Liakopoulou, S.; Kakana, M.M.; Avtji, P.; Genitsaris, E.; Naniopoulos, A. Investigating the preferences of students towards the creation of a carpooling system serving the academic bodies of Thessaloniki city. *Transp. Res. Procedia* **2017**, *24*, 425–432. [CrossRef]
41. Malodia, S.; Singla, H. A study of carpooling behaviour using a stated preference web survey in selected cities of India. *Transp. Plan. Technol.* **2016**, *39*, 538–550. [CrossRef]
42. Neoh, J.G.; Chipulu, M.; Marshall, A.; Tewkesbury, A. How commuters' motivations to drive relate to propensity to carpool: Evidence from the United Kingdom and the United States. *Transp. Res. Part A Policy Pract.* **2018**, *110*, 128–148. [CrossRef]
43. Shaheen, S.; Stocker, A.; Mundler, M. Online and App-Based Carpooling in France: Analyzing Users and Practices—A Study of BlaBlaCar. In *Disrupting Mobility*; Meyer, G., Shaheen, S., Eds.; Lecture Notes in Mobility; Springer: Cham, Switzerland, 2017.
44. van der Waerden, P.; Lem, A.; Schaefer, W. Investigation of Factors that Stimulate Car Drivers to Change from Car to Carpooling in City Center Oriented Work Trips. *Transp. Res. Procedia* **2015**, *10*, 335–344. [CrossRef]
45. Zhang, Y.; Zhang, Y. Examining the Relationship between Household Vehicle Ownership and Ridesharing Behaviors in the United States. *Sustainability* **2018**, *10*, 2720. [CrossRef]
46. Peterson, R.A.; Brown, S.P. On the Use of Beta Coefficients in Meta-Analysis. *J. Appl. Psychol.* **2005**, *90*, 175–181. [CrossRef]
47. Polanin, J.; Snilstveit, B. *Converting between Effect Sizes*; The Campbell Collaboration: Oslo, Norway, 2016.
48. Wilson, D. Practical Meta-Analysis Effect Size Calculator. Available online: https://campbellcollaboration.org/escalc/html/EffectSizeCalculator-SMD1.php (accessed on 27 November 2018).
49. Lenhard, W.; Lenhard, A. Computation of Effect Sizes. 2014. Available online: http://www.psychometrica.de/effect_size.html (accessed on 15 July 2018).
50. Mehana, M.; Reynolds, A.J. School mobility and achievement: A meta-analysis. *Child. Youth Serv. Rev.* **2004**, *26*, 93–119. [CrossRef]
51. Huedo-Medina, T.B.; Sánchez-Meca, J.; Marín-Martínez, F.; Botella, J. Assessing heterogeneity in meta-analysis: Q statistic or I2 index? *Psychol. Methods* **2006**, *11*, 193. [CrossRef]
52. Beale, J.R.; Bonsall, P.W. Marketing in the bus industry: A psychological interpretation of some attitudinal and behavioural outcomes. *Transp. Res. Part F Traffic Psychol. Behav.* **2007**, *10*, 271–287. [CrossRef]
53. Fisk, R.P.; Dean, A.M.; Alkire, L.; Joubert, A.; Previte, J.; Robertson, N.; Rosenbaum, M.S. Design for service inclusion: Creating inclusive service systems by 2050. *J. Serv. Manag.* **2018**, *29*, 834–858. [CrossRef]

54. Friman, M.; Huck, J.; Olsson, L.E. Transtheoretical Model of Change during Travel Behavior Interventions: An Integrative Review. *Int. J. Environ. Res. Public. Health* **2017**, *14*, 581. [CrossRef]
55. Olsson, L.; Huck, J.; Friman, M. Intention for Car Use Reduction: Applying a Stage-Based Model. *Int. J. Environ. Res. Public. Health* **2018**, *15*, 216. [CrossRef]
56. Shoshany Tavory, S.; Trop, T.; Shiftan, Y. Self-organized ridesharing: Multiperspective annotated review. *Int. J. Sustain. Transp.* **2019**, 1–10. [CrossRef]
57. Bruck, B.P.; Incerti, V.; Iori, M.; Vignoli, M. Minimizing CO_2 emissions in a practical daily carpooling problem. *Comput. Oper. Res.* **2017**, *81*, 40–50. [CrossRef]
58. Shaheen, S.; Cohen, A. Shared ride services in North America: Definitions, impacts, and the future of pooling. *Transp. Rev.* **2018**. [CrossRef]
59. Hulse, L.M.; Xie, H.; Galea, E.R. Perceptions of autonomous vehicles: Relationships with road users, risk, gender and age. *Saf. Sci.* **2018**, *102*, 1–13. [CrossRef]
60. Nuzzolo, A.; Comi, A.; Papa, E.; Polimeni, A. Understanding taxi travel demand patterns through floating car data. *Adv. Intell. Syst. Comput.* **2019**, *879*, 445–452. [CrossRef]
61. Harper, C.D.; Hendrickson, C.T.; Mangones, S.; Samaras, C. Estimating potential increases in travel with autonomous vehicles for the non-driving, elderly and people with travel-restrictive medical conditions. *Transp. Res. Part C Emerg. Technol.* **2016**, *72*, 1–9. [CrossRef]
62. Stone, D.L.; Rosopa, P.J. The advantages and limitations of using meta-analysis in human resource management research. *Hum. Res. Manag. Rev.* **2017**, *27*, 1–7. [CrossRef]