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Socioeconomic, demographic and socio-psychological predictors of carsharing

Bachelor's thesis in Psychology – PSY2902
Supervisor: Milad Mehdizadeh
May 2022

NTNU
Kunnskap for en bedre verden

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PREFACE

The research project focuses on how socio-psychological factors influence individuals' preferences to use carsharing. The framework of this study is planned by the supervisor, Milad Mehdizadeh. I was part of the bachelor project "BA11-Socio-psychological predictors of transport mode use", and the group consisted of 8 students. The thesis, tables and reference list are structured according to APA 7th edition (American Psychological Association, 2020).

The thesis questions and hypotheses were generated based on previous findings and papers on the connection between psychology and carsharing. Refinement of the hypotheses and conceptual clarity was gained from conversations with the thesis' supervisor and assistants. The ideas in this study are my own. The previous findings are also based on my own research.

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ABSTRACT

The aim of this bachelor thesis is to investigate how socioeconomic, demographic and socio-psychological factors influence individuals' use of carsharing in Trondheim. Carsharing is a rapidly growing service which provides customers with short-term access to shared vehicles (Hjorteset & Böcker, 2020; Jain et al., 2021; Schaefers, 2013). By acquiring an overview on people's preferences towards carsharing, the current study can help improve the carsharing market and gain insight into the environmental effects of carsharing. A cross-sectional design was utilized, alongside a self-administered anonymous questionnaire. The sample consisted of 384 participants, 217 women and 167 men. Principal Component Analysis (PCA) and hierarchical regression analysis was employed in the current study. The results indicated that younger people, males, highly educated people, and environmentally friendly individuals were the most likely to utilize carsharing. Income, geographics, financial considerations, social status, and social norms were also measured, but were insignificant predictors to carsharing. Additionally, limitations and suggestions for future research are discussed.

Many new mobility options are emerging, one of these being carsharing. Carsharing provides customers with short-term access to shared vehicles, usually parked in designated locations. Members of carsharing services can rent vehicles from anywhere between half an hour to several days (Jain et al., 2021; Schaefers, 2013). Although currently classified as a niche concept, carsharing has experienced a rapid growth in Western Europe and North America in the recent years. The rise in carsharing services is mainly located in urban and metropolitan areas (Hjorteset & Böcker, 2020). Carsharing services are currently in over 1100 cities, and in over 27 countries on five continents (Peterson & Simkins, 2019). While the concept of carsharing has been present for several decades, the recent entry into the market by large car manufacturers has led to increased attention. This solution for future urban mobility has attracted new consumers who have not previously considered carsharing as an option, but rather depended on private vehicle usage (Schaefers, 2013). Carshare offers a new perspective on mobility, which can cause a change in both personal lives and on a global level.

Individuals' behavior towards travel mode choice has been shown to be related to socio-psychological factors and theories. Travel mode refers to the way in which a passenger or goods are transported from one place to another (Merriam-Webster, n.d.). Socio-psychological factors are features that affect an individual's psychological and social state. These features can explain the individual's relationship with their social environment, and how this influences their physical and mental health (Thomas et al., 2020). Socio-psychological variables are crucial to understanding how and why individuals make their travel mode choices. These variables include social- and personal norms, demographic and socioeconomic variables and quality attributes (Jain et al., 2021).

The aim of the current study is to identify how demographic, socioeconomic and socio-psychological factors influence individuals' use of carsharing in Trondheim. By acquiring an overview of the variables that impact carshare usage, this study can help improve the carsharing market and increase the appeal to possible future carshare users. A more sustainable way of car travel and several other environmental benefits can take place by growing the market and knowledge about carsharing.

Previous findings

Demographic and socioeconomic variables; Gender, age, education & geographics

Prieto et al. (2017) suggested that demographic factors were the most eminent determinants of travel demand. Several studies found that younger people were more likely to use carsharing services than older people (Burkhardt & Millard-Ball, 2006). Previous literature indicate that carsharing elicits greater interest among younger generations than among older people (Hjorteset & Böcker, 2020).

One of the most prominent demographic factors predicting carshare usage is gender. Several studies showed that males were more likely than women to use carsharing (Prieto et al, 2017; Burkhardt & Millard-Ball, 2006). Prieto et al. (2017) proposed that men having fewer safety concerns were one of the reasons to why males are more likely than women to use the service. Although several studies have found a positive correlation between being male and carsharing service usage, Hjorteset and Böcker (2020) found no direct effect between gender and carsharing. Hjorteset and Böcker (2020) state that men were found to be less environmentally friendly than women, and for that reason, less interested in carsharing.

Education and income seemed to be important predictors within many studies on people's perception of carsharing. People with a moderate/upper income seemed to be more likely to carshare (Hjorteset & Böcker, 2020). Burkhardt and Millard-Ball (2006) found that highly educated people, holding bachelor's degrees and other advanced degrees, were more attracted to carsharing. Similarly, Prieto et al. (2017) found that people with graduate level education were more likely to choose carsharing options. Hjorteset and Böcker (2020) suggested that the effect between education and interest in carsharing was indirect. While they did not find any direct effect on interest in carsharing, they found that individuals with a higher education were more environmentally conscious and because of this had a higher and indirect interest in carsharing.

The last prominent socioeconomic and demographic predictor of carsharing is place of residence. Several researchers have found that people living in city centers, populated areas and urban areas were more likely to carshare (Prieto et al., 2017; Hjorteset & Böcker, 2020). For example, people living in Oslo were more likely to participate in carsharing than those living in other, less-dense

areas and cities (Hjorteset & Böcker, 2020). These findings can be skewed, and this is most likely because there's a higher percentage of carsharing services in bigger cities than small cities.

Environmental consciousness

Environmental consciousness has been an important variable in many research papers about carsharing. Various environmental and traffic psychologists state that individuals who are environmentally friendly are more likely to be members of carsharing services (Hjorteset & Böcker, 2020; Schaefers, 2013). Sharing cars can be a solution to more sustainable consumer behavior due to the reduction of vehicle ownership, which then can result in environmental benefits (Hartl et al., 2018). Despite the common belief that carsharing is a more environmentally friendly option than private car ownership and usage, some authors have argued that such services can have potential negative environmental impacts. Shaheen et al. (2012) stated that carsharing can lead to an increase in vehicle usage rates and possibly encourage individuals to keep their car or even purchase new vehicles to lease it. A study by Ramos & Bergstad (2021) refer to evidence that show that users of carsharing services do not necessarily own fewer vehicles, or use the service primarily for environmental concerns.

Previous research have found that sustainability and environmental friendliness acts as a "nice bonus" to carshare members, rather that the main motive (Jain et al., 2021). Several researchers show that environmental concerns are not among the primary priorities among carshare users, even though carsharing services position themselves as green services (Hartl et al., 2018; Jain et al., 2021). Increasing one's own personal utility, such as reducing expenses and increasing convenience, is shown to be more important than to contribute to a collective utility, such as reducing global warming (Bardhi & Eckhardt, 2012). For that reason, environmental concerns play a minor role for carshare usage compared to convenience and financial considerations (Bardhi & Eckhardt, 2012; Hartl et al., 2018).

Financial considerations

Financial considerations seem to be a crucial predictor when choosing to use carsharing services. Jain et al. (2021) state that interviews with the participants in their study confirmed that cost was one of the key motivators of carsharing. By using carsharing services, the customer can reduce their transportation expenses, because they spend less on renting a carshare vehicle than owning their own car. Saving money on transportation is vital to several people because this allows them to allocate budget to other expenses (Schaefers, 2013). Likewise, being careful with money is correlated to carshare usage (Hjorteset & Böcker, 2020). In conclusion, people with a high income but still cost-sensitive are the most likely to partake in carshare services (Burkhardt & Millard-Ball, 2006).

Social status

Jain et al. (2021) categorizes psycho-social variables into instrumental, affective, and symbolic constructs. Symbolic and affective constructs include how an object provoke feelings and psychological or emotional considerations. The psycho-social factor "social status" is an example of the symbolic-affective construct. This is supported by Schaefers (2013) who found that self-expressiveness and symbolic desire is affective. Comparing opinions, behavior and possessions with peers is ordinary for most people (Jain et al., 2021).

Self-interest and socially desirable outcomes have been correlated with the usage of carsharing. In many societies, cars are considered a status symbol and therefore affect the attractiveness of carsharing. Peterson and Simkins (2019) suggests that one reason consumers adopt carsharing is because of the symbolic lifestyle. Some people may reject carsharing because they consider the lack of car ownership as demeaning. This is because car ownership and choice of transport is perceived as an indicator of the individual's personal worth and social status (Jain et al., 2021). On the other side, people view carsharing as an opportunity to access more luxurious cars than they can afford to buy.

Social norms

Several studies have investigated the role of social norms in relation to travel behavior. Social norms are defined as what is commonly done or approved and disapproved. There are two types of social norms: injunctive norms and descriptive norms. Injunctive norms er defined as "behavior commonly approved or disapproved". Meanwhile, descriptive norms refers to "behavior shown by most group members" (Jain et al., 2021). One example of a descriptive norm is imitation of friends and family, and this have been identified as a predictor of intention to carshare (Bulteau et al., 2019). Jain et al. (2021) found that several carshare members felt coerced by family and friends to discontinue carsharing in favor of private car ownership. In the same study, they found that carshare members who had friends living in urban areas were more encouraged to adapt a carsharing lifestyle. On the other hand, family and friends living in outer parts of the city were less supportive.

The Theory of Planned Behavior (TPB) postulate that social norms can impact one's behavior. TPB is a theory designed to predict psychological factors, such as intentions and behavior. The theory is therefore a model used to interpret social behaviors (Zhang et al., 2018). TPB revolves primarily around injunctive norms, for example expectations from parents, friends, and partners (Ajzen, 1991). This theory can be an effective tool to understand individuals' motivation and behavior towards carsharing (Jain et al., 2021). Social norms, attitude and behavior have been proven to exert a positive significant effect on carshare usage (Zhang et al., 2018).

Research gaps

Currently, the information about the socio-psychological motivators and barriers for why people choose or don't choose to carshare is limited, especially in Norway. However, the importance of socio-psychological factors for why individuals make different mobility choices is starting to draw attention within the study field (Jain et al., 2021). Current studies about carsharing services have highlighted sociodemographic and economic variables, such as education, age, and income. These are important variables because they influence travel mode choices (Prieto et al., 2017). Even though investigating demographic variables are crucial to understanding people's mobility patterns, including psychological variables can give a clearer insight into individuals' travel

behavior. Little is known about the psychological factors that are involved in the decision to utilize carsharing (Peterson & Simkins, 2019). Therefore, the current study will focus on both sociodemographic and economic variables, as well as socio-psychological variables such as quality attributes and social norms in carshare usage in Trondheim.

The present bachelors project

The current study intends to include socioeconomic, demographic, and psychological factors when researching behavior towards carsharing in Trondheim. The study will focus on age, gender, education, income, walking time, environmental friendliness, costs, social status and social norms. Consequently, having an insight into these variables may help to increase the appeal towards carsharing services. As stated earlier, carsharing is still a niche service and only a small minority of people use this type of system regularly. Researching what makes carsharing appealing or nonappealing can help depict what the market should change to make more people interested. Some of the proven positive effects of carsharing are a modal shift toward sustainable modes of transport, reduction of annual car mileage and lowering number of cars within each household. However, the positive outcomes of carsharing can only take place if the number of carsharing customers increase (Nobis, 2006), hence the importance of the current research.

Psychology can be an important tool to predict daily mobility behavior, and therefore also make a difference in the research of climate change. Mobility and transportation is one of the main causes of greenhouse gas emissions (Hartl et al., 2018). As previously mentioned, carsharing can be a more sustainable mode of transport and have several environmental benefits. Psychological predictors can act as a source to understand carshare usage and provide knowledge about the behavior of carshare members. This knowledge can be used to grow the carshare market in Norway, as well as the knowledge and acceptance around this emerging mobility option.

THE CURRENT STUDY: THESIS QUESTIONS AND HYPOTHESES

- **Thesis question 1:** What is the role of demographic and socioeconomic variables (e.g., age, gender, income, and education) on carsharing?

- **Hypothesis 1a:** The younger the individual, the more likely they are to use carsharing services
- **Hypothesis 1b:** Men are more likely than women to use carsharing
- **Hypothesis 1c:** Higher educated people are more likely to use carsharing than people who have a lower education
- **Hypothesis 1d:** People with a higher income are more likely to participate in carsharing than people with lower income
- **Hypothesis 1e:** The closer the individual lives to the city center, the more likely they are to carshare

- **Thesis question 2:** What is the role of transport needs and quality attributes (e.g., environmental friendliness, costs, etc.) on carsharing services?
  - **Hypothesis 2a:** Environmentally friendly people are more likely to use carsharing than those who are not environmentally conscious
  - **Hypothesis 2b:** Individuals who are cost-sensitive are more likely to utilize carsharing than those who tend to spend freely and don't care about saving money
  - **Hypothesis 2c:** People who value self-presentation are less likely to use carsharing than those who care less about social status

- **Thesis question 3:** How do psychosocial factors (personal and social norms) influence whether people participate in carsharing or not?
  - **Hypothesis 3:** Individuals who are more affected by social norms, such as peer pressure and other's opinion, are more likely to take part in carsharing

METHODS

Sample

This study employed a cross sectional design. A cross sectional study involves analyzing a population at a specific point in time and across different age groups (Field, 2018, p. 1275).

The original sample consisted of 396 Norwegian participants. The ages of the participants had a range of 84, with the youngest participant being 14 and the eldest 98. A total of 9 participants

had stated that they were younger than the minimum legal driving age in Norway, which is 18. These participants were excluded from the analysis. One participant did not consent that their information could be processed until the project was completed. Two participants identified neither as a woman nor man. For that reason, 12 participants were excluded from the data, resulting in a final sample of 384.

The final sample consisted of 217 women and 167 men between the ages 18 to 98. Age, $M =$ 44.58, $SD =$ 19.69. The age group 18-30 consisted of 140 people, 57% women and 43% men. Age group between 31-50 consisted of 90 participants, 66% women and 34% men. There were 108 participants in the age group 51-70, 52% women and 48% men. In the last age group, 71-100, there were 46 people, 48% women and 52% men. The age variable was grouped together in these categories to provide an overview of gender and age.

Highest level of education completed, and annual income compared to the average in Norway, was also measured within the sample. Education level ranged from primary school to higher education. Highest education level, $M =$ 2.64, $SD =$ 0.65. Annual income ranged from far below the average Norwegian income to high above the average income. Income, $M =$ 2.57, $SD =$ 1.16. We operated with 587,600 NOK as the average annual income in Norway. Lastly, the approximate walking time in minutes from the participants home to Midtbyen (city center) was also measured. Walking time, $M =$ 53.63, $SD =$ 30.78. An overview of descriptive statistics is illustrated in Table 2.

Procedure

The participants were recruited by being asked to participate in a self-administered anonymous questionnaire that was designed by the bachelor supervisor and the bachelor students. Both convenience and snowball sampling were utilized. The recruitment happened at two shopping malls in Trondheim, as well as online. Four of the students in this bachelor program directly solicited participants in City Syd, while two others from the study group recruited participants in Trondheim Torg. The recruiting process happened from Monday 21st of February until Thursday 24th of February, from 10.00 to 16.00 o'clock. We approached people by giving them a pitch telling them we were students from NTNU writing a bachelor thesis about transport modes in

Trondheim. Those who wanted to participate filled out the survey using an iPad and were told that they could ask questions if anything was unclear. A few participants preferred to have the survey read aloud to them. The survey was also distributed on social media platforms, such as Facebook, to reach the desired response rate. Additionally, the sample had an unequal distribution between men and women. By recruiting more participants through the internet, the desired response rate was reached, as well as equalizing the gender sample.

Measurement instruments

The survey was constructed to discover information about demographic variables, socioeconomic factors, quality attributes and personal/social norms within individuals' travel mode usage and choices. In the first part of the survey, the participants were asked how likely they were to use 14 different types of transport modes if they had the access (e.g., carsharing, electric bike, walking, bus). To what extent the participant would like to use the different transport options in urban trips in the future was measured on a nine-point Likert scale (1=not at all to 9=almost every day).

The second section in the questionnaire regarded how important different aspects and needs of transport were when selecting a transport mode. Such quality attributes were for instance security, costs, and physical activity. This was measured on a five-point Likert scale (1=not at all; 2=somewhat; 3=moderately; 4=quite; 5=very). A few of the quality attributes were similar, such as physical activity and fitness. This was done to measure different dimensions within the same topic, as well as avoiding faulty answers. In the current study, quality attributes such as environmental friendliness, novelty, self-image and costs were included in the analyses.

The instruments in the third segment included personal and social norms. The participants were asked to agree or disagree with different statements. Examples of such statements were "I think that using emerging mobility options can be beneficial for me" and "Before I adopt an innovation, in general I ask the advice of my friends". A five-point Likert scale (1=strongly disagree to 5=strongly agree) was utilized in this section. In the current study, the statements "I think my social network encourages me to use emerging mobility options" and "Many people

who live in my neighborhood are very engaged in environmental issues" were utilized as the social norms variable.

On the last page of the questionnaire, the participants were asked to provide some background information. This included for instance their age, gender, highest completed education, and their annual income compared to the average in Norway. Questions about car access, driver's license and where they lived in comparison to the city center was also asked in this section. These were measured by scales and answer options.

Statistical procedure

Data were analyzed using IBM SPSS Statistics 27. The outcome variable was carsharing, whilst predictor variables were demographic and socioeconomic variables (e.g., gender, income, etc.), quality attributes (e.g., environmental friendliness, social status, costs, etc.) and social norms. The variable "gender" was transformed to a binary variable. Women were altered from 1 to 0, and men from 2 to 1. Additionally, this variable was cleaned because the individuals who chose the options "prefer not to say" and "other" were excluded.

To test which factors predicted carshare usage, Principal Component Analysis (PCA) and hierarchical regression analysis were performed. Descriptive statistics for the variables was provided for an overview of the data, see Table 2. The PCA was used as a tool to reduce the number of quality attributes into four components. Hierarchical regression analysis with three blocks was conducted. According to Field (2018, p. 398), this method provides more information than for example multimodal regression analysis. The first block included socioeconomic and demographic variables. The second block calculated both block 1 and quality attributes. The last block included both the first and second block, whilst also adding social norms.

Several demographic and socioeconomic factors, the four components from the PCA, environmental friendliness and costs were the variables utilized in the hierarchical regression analysis. "Environmental friendliness" and "costs" were excluded from the PCA but included in the hierarchical regression analysis because they're a crucial part of the hypotheses for the current study but were not suited for the PCA. In addition to this, a variable about social norms was created by including the questions "I think my social network encourages me to use

emerging mobility options" and "Many people who live in my neighborhood are very engaged in environmental issues".

Two variables had to be dummy coded to properly fit into the hierarchical regression analysis. This is because one is not able to use a categorical variable with more than two categories in this analysis (Field, 2018, p. 509). The first variable that was dummy coded was the variable which measured the annual income compared to the average in Norway. This was measured on a scale from 1-5, where 1 was much below average and 5 was much above average. After dummy coding this variable, answers 1-3 equaled below average and was renamed 0, whilst 4-5 was above average and named 1. The second variable that was dummy coded was the highest level of education the participant had completed. Originally, this was a categorical variable with four response options (1=primary school; 2=high school; 3=university/college; 4=other). This variable was dummy coded into higher education and other. Other was option 1, 2 and 4, whilst high education equaled option 3 which was university/other.

Multicollinearity is a complication because it makes it challenging to interpret which of the correlated variables predict the outcome. If the correlation between the variables is high enough, often above .8, it can create problems when adapting blocks and interpreting results (Field, 2018, p. 402). Multicollinearity was not discovered for any of the three blocks within the hierarchical regression analysis. This was assessed through Variance Inflation Factor (VIF). Field (2018, p. 402) consider VIF values below 10 and tolerance above 0.1 to be acceptable. In the hierarchical regression analysis, the VIF values never exceeded 10 and the tolerance was between .6 and .9. Therefore, the VIF was acceptable and not considered a problem.

Dimensionality and reliability of the measurement instruments

Table 1 shows the outcome of a PCA for the 11-item measure of quality attributes towards transport mode choices. 6 items were removed from the analysis. The items "reliability", "travel time", "environmental friendliness" and "protection from bad weather" were removed because they had loadings above .03 on several components. The items "costs" and "stress" were also excluded because the component had a low Cronbach's alpha, whilst also being irrelevant to the current study.

The measure of quality attributes formed four components, whereas these explained 66% of the total variance. The first component was termed "protection & well-being" and included three items. The items were "safety", "security" and "comfort". The second component was named "user friendliness" and consisted of the items "travel speed", "convenience", "accessibility" and "flexibility". The third component included the items "physical activity" and "fitness" and was named "physical activity". The first three components had Cronbach's alpha values above the recommended rule-of-thumb of .65 (Vaske et al., 2017). The last component was named "social status" and contained the items "self-image" and "novelty". This was the only component that had Cronbach's alpha <0.6, (α = .381).

Despite finding an alpha value below the recommended threshold, the social status component was included in the analysis. It can by troublesome to not employ Cronbach's alpha because it is a common measure of validity, reliability, and internal consistency (Field, 2018, p. 822). Despite this, many scientists claim that the use of a Cronbach's alpha is meaningless for two-item scales and that other reliability estimates are more suitable (Eisinga et al., 2013). Similarly, many state that using two-item scales are problematic because more items lead to a better construct representation and reliability. Rather than Cronbach's alpha, it is suggested to use Pearson's correlation coefficient on two-item scales (Eisinga et al., 2013). The component had a low to moderate correlation when analyzed with Pearson. Therefore, the social status component was kept in the analysis despite a low Cronbach's alpha. The decision to keep this component was made because one of the hypotheses for the current study involves the items "novelty" and "self-image".

Table 1

PCA about quality attributes of transport modes (N = 384)

	Protection & well-being	User friendliness	Physical activity	Social status	Communalities
Travel speed	.12	**.75**	-.03	.16	.60
Convenience	**-.01**	**.73**	.08	.02	.54
Accessibility	-.11	**.66**	.02	.00	.47
Flexibility	.01	**.73**	-.04	-.17	.54
Fitness	.03	-.02	**-.93**	.05	.87
Physical activity	-.01	-.01	**-.93**	-.00	.87
Safety	**-.91**	-.11	-.03	-.09	.80
Security	**-.78**	.10	-.13	-.07	.69
Comfort	**-.70**	.09	.15	.19	.58
Self-image	.13	.00	.05	**.87**	.74
Novelty	-.26	.01	-.18	**.63**	.57
Eigenvalue	1.42	2.80	1.87	1.16	
% of variance	13	25	17	11	
Cronbachs α	.74	.69	.86	.38	
Total variance				66	

Note. Component loadings higher than 0.30 are marked in bold; rotated with direct oblimin with Kaisers Criterion

RESULTS

Table 2

Descriptive statistics for demographics and socioeconomic variables, and quality attributes (N = 384)

Variable	Min.	Max.	*M*	*SD*
Socioeconomic and demographic				
Age	18	98	44.58	19.69
Gender	0	1	0.43	0.50
Education	1	4	2.64	0.65
Income	1	5	2.57	1.16
Walking time	0	99	53.63	30.78
Quality attributes				
Safety	1	5	4.31	0.94
Comfort	1	5	3.72	0.90
Environmental friendliness	1	5	3.78	1.01
Self-image	1	5	2.31	1.19
Costs	1	5	4.09	0.91
Stress	1	5	3.81	1.08
Flexibility	1	5	4.30	0.75
Protection from bad weather	1	5	3.92	1.02
Traveltime	1	5	4.04	0.92
Convenience	1	5	4.32	0.72
Physical activity	1	5	3.39	1.08
Reliability	1	5	4.41	0.73
Security	1	5	4.35	0.91
Fitness	1	5	3.04	1.14
Travelspeed	1	5	3.81	0.91
Accessibility	1	5	4.38	0.74
Novelty	1	5	2.23	1.25

Regression analysis is a method used to explain the connection between one or more independent variables and a dependent variable (Field, 2018, p. 371). Therefore, a hierarchical regression analysis with three blocks was run to test carsharing predicted by socioeconomic and demographic variables, quality attributes and social norms. As illustrated in Table 3, the first block consisted of socioeconomic and demographic variables, such as gender and education. Block 1 predicted 4%, R^2adj = .04, p = .000, of carshare use. All three blocks were significant but block 1 was the most significant. The second block measured the predictor variables of quality attributes from block 1, as well as the four components from the PCA, environmental friendliness and costs. Block 2 increased the prediction to 7%, ΔR^2 = .04, R^2adj = .07, p = .003. Social norms were added in the third block. In Block 3, it stagnated on 7%, ΔR^2 = .00, R^2adj = .07, p = .019.

In block 1, the strongest predictor was age, β = -0.16, p < .001, followed by education, β = 0.11, p < .05. Gender, walking time and income were insignificant. In block 2, age was still the strongest predictor, and had increased in value, β = -0.23, p = .000. Gender became significant in block 2, β = 0.13, p < .05. Another significant predictor was environmental friendliness, β = 0.13, p < .05, and then education, β = 0.11, p < .05. Walking time, income, protection and well-being, user friendliness, physical activity, social status, and costs were found to have no significance. In block 3, age was again the strongest predictor, β = -0.26, p = .000. This was followed by gender, β = 0.13, p < .05, then environmental friendliness, β = 0.12, p < .05, and lastly education, β = 0.11, p < .05. Walking time, income, protection and well-being, user friendliness, physical activity, social status, costs, and social norms were insignificant, p > .05.

Table 3

Hierarchical regression analysis for predicting carsharing use (N = 384)

Step	Independent variable	b	SEb	β	p	R²adj	ΔR²
Block 1					.000***	.04	.05
1	Gender	0.35	0.22	0.08	.111		
2	Age	-0.02	0.01	-0.16**	.004		
3	Walking time	-0.00	0.00	-0.06	.243		
4	Education	0.49	0.22	0.11*	.030		
5	Income	0.02	0.27	0.00	.954		
Block 2					.003**	.07	.04
1	Gender	0.56	0.22	0.13*	.013		
2	Age	-0.03	0.01	-0.23***	.000		
3	Walking time	-0.00	0.00	-0.05	.361		
4	Education	0.47	0.23	0.11*	.038		
5	Income	-0.01	0.27	-0.00	.961		
6	Protection & well-being	0.21	0.12	0.10	.068		
7	User friendliness	0.08	0.11	0.04	.475		
8	Physical activity	0.18	0.12	0.08	.134		
9	Social status	-0.07	0.11	-0.03	.512		
10	Environmental friendliness	0.28	0.11	0.13*	.015		
11	Costs	-0.00	0.12	-0.00	.985		
Block 3					.019*	.07	.00
1	Gender	0.57	0.22	0.13*	.012		
2	Age	-0.03	0.01	-0.26***	.000		
3	Walking time	-0.00	0.00	-0.05	.384		
4	Education	0.48	0.23	0.11*	.035		
5	Income	-0.01	0.27	-0.00	.972		
6	Protection & well-being	0.21	0.12	0.10	.073		
7	User friendliness	0.08	0.11	0.04	.479		
8	Physical activity	0.17	0.12	0.08	.166		
9	Social status	-0.09	0.11	-0.04	.431		
10	Environmental friendliness	0.25	0.12	0.12*	.039		
11	Costs	0.01	0.12	0.00	.950		
12	Social norms	0.13	0.13	0.05	.337		

*Note. * p < .05, ** p < .01, *** p < .001*

DISCUSSION

Age

A significant, negative effect was found between age and carshare usage. Therefore, Hypothesis 1a was supported. The results show that the younger the individual, the more likely they are to carshare. This aligns with previous findings, such as Burkhardt and Millard-Ball (2006) and Hjorteset and Böcker (2020), that indicate that younger people are more interested in carsharing than older people. Hjorteset and Böcker (2020) state that older people often own a private car, thereby making them less likely to partake in carsharing. In the same paper, they proclaim that younger generations are less interested in car ownership and are even postponing obtaining their drivers license.

Life events play an important role when choosing transport modes. A reason to why younger people are more interested in carsharing can be because it is more suitable to their life situation. Older people are more likely to have a stable job, children, and a more established lifestyle. Hjorteset and Böcker (2020) mention that students and younger people tend to start new jobs, and therefore gravitate towards carsharing. Jain et al. (2021) found that childbirth and house purchases were important factors for carshare members to end their carsharing membership. Childbirth and house purchase are connected to purchasing private cars, since people consider this the default way of life and a rite of passage. By purchasing a house, most people also access garages to store their private cars, therefore no longer making parking an obstacle.

One of the main barriers reported from ex-carshare members was related to difficulties in technology. This includes effort in managing bookings, tracking booking time and taking photos (Jain et al., 2021; Ramos & Bergstad, 2021). Older people seem to be more reluctant to adopting new technology, whilst younger people are more willing to learn (Charness & Boot, 2009). Several new ways to use technology are linked to new emerging mobility alternatives, including carsharing. Younger people may have an easier time adapting to using and booking carsharing services, and this may be a reason to why younger people are more likely to utilize carsharing than older people.

Gender

Hypothesis 1b was supported as well. Men were found to be more likely to carshare than women. It is interesting to note that gender was not significant in block 1 but became significant in block 2 after including the variable "environmental friendliness". This indicates that males who are environmentally conscious are the most likely to carshare. This finding contradicts with Hjorteset and Böcker (2020) that found that men were less environmentally friendly than women, hence also less interested in carsharing.

A few distinctions in research methods differentiated Hjorteset and Böcker's (2020) study from the current study, despite both including a Norwegian sample. First, the sample in Hjorteset and Böcker's (2020) study was greater than the sample in the current bachelor thesis. They had 2241 participants, whilst the current study only had 384 participants. Secondly, different analyses were utilized in the two research papers. The current study employed a hierarchical regression analysis, whereas Hjorteset and Böcker (2020) used Structural Equation Modelling. These could have been reasons to why they found that males were less environmentally friendly, whereas the current study found that environmentally friendly males were the most likely to carshare. Despite Hjorteset and Böcker's (2020) results, most of the literature review state that there is a positive correlation relationship between males and carsharing (Burkhardt & Millard-Ball, 2006; Prieto et al., 2017).

Prieto et al. (2017) theorized that the reason for men being more likely to carshare could be attributed to men having fewer safety concerns. They found that being male was indicative of fewer safety concerns and far more flexibility in arranging car trips through carsharing. Jain et al. (2021) claim that poor initial experience and operational issues were factors that discouraged people from continuing to carshare. Women may for example be more wary compared to men about renting cars from strangers, and therefore have a higher risk of feeling unsafe and have a poor experience with carsharing, hence less likely to utilize the service.

Education and income

Hypothesis 1c was supported and deduced that those individuals with higher education are more likely to carshare than those with a lower education. This correlates with previous findings which

state that higher educated individuals had a higher interest in carsharing (Burkhardt & Millard-Ball, 2006; Prieto et al., 2017). A reason to why education plays an important role when researching interest in carsharing can be because previous findings have found that individuals with higher education are more environmentally conscious (Hjorteset & Böcker, 2020). It has been found through several studies that environmentally conscious individuals are more likely to be interested in carsharing (Hjorteset & Böcker, 2020; Schaefers, 2013). The results showed that the prediction for education escalated when the variable of environmental friendliness was included in the analysis, as illustrated in Table 3.

Previous findings also state that higher educated people have a higher income, hence a higher interest in carsharing (Burkhardt & Millard-Ball, 2006). Despite previous findings, the results of the current study did not find any significance for the income and costs variables, therefore Hypothesis 1d and 2b was not supported. People with a higher income were not found to be more likely to participate in carsharing than individuals with lower income. Likewise, individuals who value cost-savings were not found to be more likely to carshare than those who tend to spend freely. These findings contradict with most of the previous findings about the correlation between financial considerations and carsharing. Hartl et al. (2018) even proclaimed that financial considerations and income were one of the main predictors for utilizing carshare services.

A reason to why income and costs showed no significance in prediction for carsharing can be attributed to the sample within the current study. Firstly, the sample was fully Norwegian. Norway is a developed country with a high standard of living (Anderson et al., 2006). High income, and general financial satisfaction, can be a reason to why financial considerations play a minor role within a Norwegian sample compared to other samples in other countries. Secondly, social desirability can have attributed to the insignificant results between carsharing and financial considerations. Several participants wanted us to read the survey aloud, thereby making it possible for the researchers to see what their average annual income was, as well as their stance on costs. This could have been distressing for the participants and therefore they could have motivated them to give socially desirable answers. This will be elaborated in the section about limitations, implications, and further research.

Environmental friendliness

Hypothesis 2a was supported, because the results showed that environmentally friendly people are more likely to carshare than those who are not environmentally conscious. This finding aligns with previous findings, which state that environmental consciousness play a role in whether or not individuals choose to carshare (Hjorteset & Böcker, 2020; Schaefers, 2013). Carsharing is deemed as a new and more sustainable way to travel by car. As stated earlier, the transportation sector generates the largest share of greenhouse gas emissions. Therefore, sharing cars can be a solution for more sustainable travel habits. Carsharing can lead to reduction of private car ownership, hence result in environmental benefits (Hartl et al., 2018). This view may appeal to environmentally friendly individuals who still wish to travel by car.

Although the benefits of carsharing services are widely accepted among experts and users, the environmental impacts of personal vehicle sharing are still contemplated. Unlike carsharing services, peer-to-peer carsharing services (p2p) rent out privately owned vehicles from existing car owners (Prieto et al., 2017). Shaheen et al. (2012) postulate that a potential negative environmental impact of p2p carsharing could be an increase in vehicle usage rates, because this gives people the opportunity to use a private vehicle temporarily when they can't afford to own a car. The used vehicles would likely stay parked somewhere if they were not part of a carsharing service. In addition to this, another repercussion can be that existing car owners may feel encouraged to keep their car to support rentals. Likewise, individuals may even feel persuaded to buy new cars to lease it. This is proven by Ramos and Bergstad (2021) that found that carshare members do not necessarily own fewer vehicles, nor use the service primarily based on environmental concerns.

Despite the common consensus that environmentally friendly people are more likely to carshare, a few researchers have found that environmental concerns are not the primary reason to why most carshare members use this service (Jain et al., 2021; Ramos & Bergstad, 2021). Jain et al. (2021) claim that the environmental aspect is a "nice bonus" and not the main motivation to partake in carsharing. Previous findings state that costs and convenience are more important attributes when choosing to carshare (Bardhi & Eckhardt, 2012; Hartl et al., 2018), but this contradicts with the current thesis' findings. As previously mentioned, the results showed that

costs, income, and user friendliness were insignificant predictors to carsharing, whilst environmental friendliness were a significant predictor.

Walking time and geographics

Overall, Hypothesis 1e was not supported. The results showed no significant relationship between how close the individual lived to the city center and how likely they were to carshare. This is an interesting finding because most of the previous research states that a prominent demographic predictor of carsharing is the proximity of the individual's home to the city center (Hjorteset & Böcker, 2020; Prieto et al., 2017). Hjorteset and Böcker (2020) claim that individuals living in Oslo were more likely to carshare than those living in less urban areas. In the current study, this would have meant that people living in Trondheim, or close to the city center, were the most likely to participate in carsharing services. This presumption was not supported by the findings in the current study.

The previous findings can be problematized because the discovery can be based on availability of carsharing services in urban cities, rather than the individual's preference. Even Hjorteset and Böcker (2020) claim that most carsharing services are mainly located in urban and metropolitan areas. Because of the lack of availability, it is more difficult for individuals living in less-dense areas to engage in carsharing. Therefore, it can be assumed that there is no correlation between the individual's place of residence and carshare usage, and that the results of the current study have postulated the correct findings.

Social norms and social status

Hypothesis 2c and 3 were not supported. The findings did not prove that individuals who value self-presentation were more likely to carshare than those less affected by social status. Neither did the results show any correlation between carshare usage and social norms. Peterson and Simkins (2019) state that self-interest and social desirability are associated with carsharing, and several consumers adopt carsharing because of the symbolic lifestyle. Perhaps the participants in the current study were less affected by the idea of social status than most other people, and

therefore the results showed no significance. Another reason to why the current thesis' findings diverge from previous findings could be because the instrument that measured social status was not adequate. This will be elaborated in the section about limitations, implications, and further research.

Previous findings state that social norms have a positive, significant effect on travel behavior, including carsharing (Jain et al., 2021). According to Theory of Planned Behavior (TPB), social norms play a part in people's behavior, and consequently impact one's travel behavior (Zhang et al., 2018). A reason why the findings of the current study does not correspond with previous findings could be because of cultural differences and the sample's nationality. Jain et al. (2021) did their research on Australian participants and found that social norms impacted their perception and usage of carsharing. For instance, several participants mentioned that they felt coerced by family and friends to own a private car rather than use a carshare service. The current study included only Norwegian participants, and no correlation between social norms and carsharing was found. This could perhaps be because there's greater distances from one place to another in Australia, and therefore a bigger necessity for a car. Jain et al.'s (2021) sample was mainly in Melbourne, a city with 5 million residents and 10 000 square kilometers (World Population Rreview, 2022). On the other hand, Trondheim is a small city with only 210 000 residents and just under 350 square kilometers (SSB, 2021). A smaller city could equal less necessity for a car.

LIMITATIONS, IMPLICATIONS, AND FURTHER RESEARCH

A few limitations were detected and should be improved for further research. The main limitations were found within the survey and the recruitment. One of the first problems was misinterpretation of the questions in the survey. On the first page, the participants were asked to imagine they had access to different transport modes. It became evident while talking to the participants in the shopping malls, that many of them interpreted this as direct access and ownership. Therefore, they answered "not likely" on the transport modes they didn't own, for instance an electric bike, instead of imagining how likely it would be that they used said transport mode if they had access.

On the second page, the participants had to rate how important different quality attributes were in the choice of transport mode. One of the quality attributes on this page was self-image. Self-image was not defined in the survey, and many participants expressed that they didn't understand the meaning of this attribute. When a participant asked, we explained that self-presentation, social status and how society view the individual was important factors within self-image. There were still many participants that didn't ask of the definition for this quality attribute, and therefore could have made their own definition that didn't correlate with ours.

Another limitation that could have caused fabricated answers were that many participants, especially older people, preferred for us to read the survey out loud. Therefore, we were able to hear and see their answers. This can have caused the problem of social desirability and resulted in untruthful answers. DeMaio (1984) defines social desirability as the tendency to give a favorable picture of oneself. For instance, these participants could have scored themselves as more environmentally friendly than if they had answered the survey anonymously. This could also have been the case for the question about annual income compared to the average in Norway. Income is a sensitive subject, and participants could have been too embarrassed to admit that they were below the average. In fear of being considered socially undesirable and experience social disapproval, participants may choose to give false and fabricated answers (Tourangeau & Yan, 2007).

Future research could benefit from implementing the considerations mentioned above. When designing a survey, it's important to keep in mind that the questions can be interpreted differently than intended. It is therefore important to write clear questions and give precise definitions. Further research may also benefit from implementing other measurement instruments to analyze the effect of income, walking time, costs, social status, and social norms on carsharing. These variables were found to be highly correlated with carshare usage in previous findings but showed insignificance in the current study. Therefore, further research could benefit from analyzing these variables in a different perspective. By being aware of the mentioned considerations and limitations, further research can avoid other problems that may arise, as well as implement other measurement instruments and variables to expand the research.

CONCLUSION

The current study found that younger people, males, individuals with a higher education and environmentally friendly people were the most likely to use carsharing services. Besides these discoveries correlating with most previous findings, a few differences were detected. Income, geographics, financial considerations, social status, and social norms were not significant predictors for carsharing, despite the literature review stating so. A reason to why there could be limited research on socio-psychological variables on carsharing is perhaps because there's simply no correlation. Further research should still examine these variables to get a better understanding of how socio-psychological factors influence individuals' carshare usage.

There is strong evidence that psychology can make a difference in research of travel behavior and climate change (Ramos & Bergstad, 2021). Carsharing can be a more environmentally friendly and sustainable way to travel by car. Therefore, further research is crucial for documenting and understanding the environmental impacts of carsharing (Shaheen et al., 2012). Insightful knowledge can be provided by researching the socio-psychological predictors for carsharing (Ramos & Bergstad, 2021). This knowledge and research can help expand the carsharing market and encourage a more environmentally friendly travel behavior, both in Norway and globally.

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