The roles of sociodemographic, socioeconomic, and psychological factors in the intention to use electric bikes

PSY2900 Bachelor thesis in psychology

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Preface

The following thesis is part of the research project "BA11 – Socio-psychological predictors of transport mode use", and aimed to investigate sociodemographic, socioeconomic, and psychological factors in the intention to use electric bikes. The framework for the project was planned by the project supervisor, Milad Mehdizadeh. I formulated the research questions and the hypotheses based on previous research on the area, refined through discussions with both the project supervisor and the research assistants. The data used in the project was gathered by all the students in the bachelor project group. I conducted the PCA and the hierarchical regression analysis to find the results for this bachelor's thesis.

I would like to thank Milad Mehdizadeh, who led the project, shared important knowledge on the topic, and provided valuable and much appreciated advice. I also would like to thank the two research assistants, Matilde Flåten and Per Helge Haakstad Larsen, who provided useful information, guidance, and practical help for gathering the data. They have been very patient and helpful throughout the different stages of the project. I also want to thank my fellow students in the bachelor project group, who helped gather the data, initiated valuable discussions, and provided support and motivation. Lastly, I declare that this body of work is my own.

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Abstract

The present bachelor's project aimed to investigate how different sociodemographic, socioeconomic, and psychological factors can influence the intention to use electric bikes. The data was collected from a sample of the population in Trondheim city in Norway, and the variables that measured psychological factors were gathered into five components through a PCA, out of which three where used. To find out how well the variables could predict the intention to use electric bikes, a hierarchical regression analysis was conducted. It was found that all the factors could predict 2.7% of the variance in the intention to use electric bikes, and that age was the only significant variable, with younger age predicting the intention to use electric bikes better than older age. None of the hypotheses where confirmed, which revealed the need for further research on the factors used, as well as other possible hidden factors that could influence the intention to use electric bikes.

Introduction

In the recent years, the use of electric bikes have increased rapidly in several parts of the world, most notably in China, but also in many European countries such as the Netherlands and Germany (Popovich et al., 2014). According to Statistics Norway (SSB), the sale of electric bikes in Norway has increased with 42% just from 2017 to 2018, which was a much bigger increase than for normal bikes, which was on 3% (Dokka, 2019). Still, normal bikes are much more common, and the use of electric bikes in Norway is quite low compared to other European countries (Simsekoglu & Klöckner, 2019a). An electric bike is here defined as a bicycle with an electric motor that helps to move the bike forwards, either only when the pedals are helping, or also without using the pedals. As global warming becomes an increasingly pressing issue, new environmentally friendly solutions to transport are much needed. Electric bikes can, if replaced by motorized transport modes such as cars, reduce greenhouse gas emissions substantially, as an electric bike consumes 1/10 of the emissions made from an electric car, and 1/40 of the emissions from a conventional petrol or diesel driven car (Fishman & Cherry, 2016). Additionally, using more active transport modes, such as walking or bicycling, could increase overall health and decrease the economic cost for society from lifestyle related illnesses (Rabl & de Nazelle, 2012). Therefore, transitioning transport mode to an electric bike could be beneficial for both the environment, personal health, and the economy.

This bachelor's thesis will investigate how both sociodemographic, socioeconomic, and psychological factors can influence people in the city of Trondheim in their intention to use an electric bike. First, there will be an overview of previous findings on this research area.

Age

China has the highest amount of electric bike sales in the world (Fishman & Cherry, 2016), and consequently several studies on electric bikes has been conducted here. A study that investigated the dynamics of electric bike ownership and use in the city of Kunming in China found that increasing age had a significant positive influence on electric bike use, and that the probability of choosing an ordinary bicycle and not public transit when not using an electric

bike, increased with age (Cherry et al., 2016). Another study that investigated user characteristics and mode choice behavior of electric bike users in two different Chinese cities, Kunming and Shanghai, found that usage of electric bikes increased with age up to a certain point, then decreased with older age (Cherry & Cervero, 2007). The researchers suggest this decrease can partly be because the elderly generations in China generally are reluctant to stop using traditional transport modes and to adopt new technologies.

This tendency has also been reported in other parts of the world. Both in north America, Austria, and Australia, studies found that electric bike users were older than the general population (Fishman & Cherry, 2016). It was suggested that this could be because of self-selection bias, where those who choose to answer such forms can belong to a certain type of demographic. One example of this was mentioned for the Austrian study, where the survey had been sent out traditionally by post, rather than digitally, which could make it more difficult to reach younger people. However, most of the other studies used digital surveys, and still got more older people, so there may be other factors into play. Norway was no exception to this tendency either; in their study about the roles of psychological and socio-demographical factors for electric bike use in Norway, Simsekoglu & Klöckner (2019b) found that the people who used electric bikes, were significantly older compared to the people in the survey that didn't use electric bikes. Age was also positively correlated with the intention to buy an electric bike.

Gender

In Cherry and Cerveros study on user characteristics and mode choice behavior in Kunming and Shanghai, it was found that men in all age categories were less likely to use electric bikes than women (Cherry & Cervero, 2007). However, gender alone (not related to age) could not significantly predict electric bike use. Another study found that when provided with electric bikes, women used them more often than men (Kazemzadeh & Ronchi, 2022).

On the other hand, several studies have found the opposite. A study on electric bike use in north America found that as much as 85% of their respondents were men (Fishman & Cherry, 2016). A study from Australia had similar results, where 78% of the participants were men (Johnson & Rose, 2015). The researchers in this study pointed out that male respondents were overrepresented, and that although these results are common in Australia, studies from other countries such as the Netherlands have shown a more equal distribution between the genders

in electric bike use. This can maybe show how distribution and use of electric bikes can differ between countries and cultures, and how countries where cycling is more common and accommodated for, such as the Netherlands, also perhaps has larger and more diverse population that uses electric bikes.

A study conducted in Norway however, found that gender had no significant effect on the intention to buy an electric bike (Simsekoglu & Klöckner, 2019a). As we see here, the different studies have found substantially different results when it comes to the relationship between gender and the intention to use an electric bike, which makes it difficult to make out a clear tendency in the current research.

Education and income

A literature review on the current research on electric bikes stated that studies from California and north America as a whole, found that their respondents generally had higher education and higher income than the population average (Fishman & Cherry, 2016). The previously mentioned study from Kunming and Shanghai also found that electric bike users had higher education and income compared to normal bike users (Cherry & Cervero, 2007). A study that investigated older Australians' electric bike use found that more than 70% of their participants were highly educated with university degrees, and 47% had a higher income than the average in the population (Fishman & Cherry, 2016; Johnson & Rose, 2015). A reason for this could be that an electric bike after all is more expensive than a normal bike, therefore perhaps making it less appealing for those with lower incomes. A study from Norway also found that electric bike users had higher education levels than normal bike users (Simsekoglu & Klöckner, 2019b).

In contrast to these studies, a study by Cherry and Cervero found no significant relation between electric bike use and education level, or between electric bike use and household income (Cherry & Cervero, 2007).

User friendliness

A study that collected data from different states in India found that factors that measured user friendliness, such as flexibility, could explain well why users change transport modes from normal bike to electric bike (Venkadavarahan & Marisamynathan, 2021). Similar results was

found in a study from Norway, where mobility benefits was a strong predictor for the intention to use an electric bike (Simsekoglu & Klöckner, 2019a).

Several studies have found that being able to quickly get and maintain speed with little effort is a strong motivating factor for buying an electric bike, since this largely reduces several of the barriers reported from using normal bikes, for example distance, physical exertion, and time limitations (Fishman & Cherry, 2016). Additionally, being able to lessen these barriers could make electric bikes more user friendly for those with certain physical limitations, rather than normal bikes. Similar to this study, the study from Kunming and Shanghai reported faster speed as the primary reason for using an electric bike, in addition to the fact that they require less effort than for example normal bikes (Cherry & Cervero, 2007).

Physical activity

Fishman and Cherry's literary review on electric bike use found several studies that all reported that even though you get an overall lower physical activity level using an electric bike rather than a normal bike, electric bikes still give a sufficient level of physical activity in order to achieve health enhancement (Fishman & Cherry, 2016). Several studies have reported physical activity as one of the main reasons to use an electric bike. In Johnson and Rose's study about older Australians electric bike use, 42.0% of the participants reported maintaining or increasing health and fitness as one of their main motivations for buying an electric bike (Johnson & Rose, 2015). Another study found that health-related factors positively influenced the participants' intention to change from using a normal bike to an electric bike (Venkadavarahan & Marisamynathan, 2021). Similarly, a qualitative study on electric bike use in the Netherlands found that 8 out of 24 participants mentioned physical health as one of their most important motivators for buying an electric bike (Plazier et al., 2017).

All this suggests that physical activity generally is seen as a main motivator for using an electric bike. However, a study from Norway found that although physical activity and health was positively correlated with the intention to use an electric bike, it was a weaker predictor than other factors such as symbolic and mobility benefits (Simsekoglu & Klöckner, 2019a). The researchers suggested that this could be because some associate using an electric bike with less physical activity than a normal bike, and that it therefore is just meant for people with physical limitations who cannot use normal bikes. Even though there is a good deal of

research done on the health effects of using electric bikes, there is not as much research done on how the perception of the importance of physical activity can influence electric bike use, so more research on this area is needed.

Security and comfort

The study on older Australians' electric bike use found a significant difference in feelings of safety between those who previously used a normal bike, and those who didn't, where those that had not used a normal bike before were more likely to agree to feeling safer using an electric bike in traffic, compared to using a normal bike (Johnson & Rose, 2015). A study from Denmark found that most participants generally felt safe on both electric bikes and normal bikes (Haustein & Møller, 2016). It was suggested here that those who did feel unsafe using electric bikes, especially elderly people, were also generally more involved in accidents, which could either be because electric bike use is more widespread in older age groups, therefore making them appear more in accident statistics, or because elderly people more often reported the weight of the electric bike as the cause of the accidents, and that more weight is more difficult to handle for elderly people – thus decreasing the feeling of safety for older age groups. Another study found that those who had safety in mind were more likely to consider changing transport mode from a normal bike to an electric one (Venkadavarahan & Marisamynathan, 2021).

Several studies looked at both feelings of safety, and traffic behavior and involvement in accidents. In their study on traffic safety for electric bike users in China, Yao and Wu found that the electric bike users who had stronger positive attitudes for safety, and worried more about the risks in traffic situations, were also less likely to show behaviors that violated traffic rules (Yao & Wu, 2012). However, a study on north American and European electric bike users found no difference in safety behavior between electric bike users and normal bike users, where both kinds had high rates of traffic signal violations (Langford et al., 2015). Another study conducted in China found that safety knowledge was negatively correlated with risky behaviors, such as aggressive or incorrect driving and group violations, and that electric bike users generally lacked safety knowledge, especially for groups that had lower education, were unmarried, were young and/or had little driving experience, and for those that didn't have a driver's license (Wang et al., 2018).

This could all suggest that electric bike users, just as normal bike users, includes people with all kinds of attitudes towards safety, and that even though attitudes towards safety could predict the occurrences of traffic rule violations and accidents, it can maybe not as much predict the intention to use electric bikes in itself. Most of the studies on this area measured traffic behavior, demographics and attitudes amongst electric bike users, and the feelings and perception of safety *in* this group, yet few of them investigated how the feeling and perception of safety could predict electric bike use in the first place.

There was little research conducted on the comfort aspect for the intention to use an electric bike. However, one study investigated the attitudes of non-electric bike users both before and after the Covid-19 pandemic, where before the pandemic, the comfort of using an electric bike did not outweigh the high cost of it, but after the pandemic, people where more positive to getting an electric bike since the comfort of avoiding public transport, and thus the risk of getting infected, weighed heavier (Kazemzadeh & Koglin, 2021). There was also conducted a study were the electric bike users' levels of comfort when driving amongst pedestrian crowds where measured, and it was amongst other things found that the electric bike users' comfort were lower when meeting pedestrians from the front, rather than from behind, since its easier to communicate non-verbally and to avoid the hindrance when coming in front of the pedestrians (Kazemzadeh & Bansal, 2021). But since the research on this aspect was scarce, there could still potentially be much to explore here.

The present bachelors' project

Although there has been done more and more research in the recent years on people's intentions to use electric bikes, there is relatively less research done on psychological factors. The current project aims to investigate both sociodemographic, socioeconomic, and psychological factors in the intention to use electric bikes.

Research questions and hypotheses

Research question 1: What are the roles of sociodemographic and socioeconomic factors in the intention to use electric bikes?

- **Hypothesis 1:** The intention to use electric bikes will be positively predicted by older age.
- **H2:** The intention to use electric bikes will be predicted as higher for women than for men.
- **H3:** The intention to use electric bikes will be positively predicted by higher education.
- **H4:** The intention to use electric bikes will be positively predicted by higher income.

Research question 2: What are the roles of psychological factors in the intention to use electric bikes?

- **H5:** The intention to use electric bikes will be positively predicted by user friendliness.
- **H6:** The intention to use electric bikes will be positively predicted by physical activity.
- **H7:** The intention to use electric bikes will be positively predicted by security and comfort.

Methods

Sample

The study had a cross-sectional design, and in total we got 396 participants. However, several respondents had to be removed from the dataset for different reasons; one had not consented to letting their information be used in the project, nine participants were under the age of 18 and could therefore not consent to participate, and two people reported their gender as something else than female or male, and were therefore to few to be used to draw any general conclusions about gender.

After removing these participants, the sample now consisted of 384 participants, where 217 (56.5%) of these were women, and 167 were men (43.5%), $M = 0.43$, $SD = 0.50$. The participants' ages ranged between 18 and 98 years old, $M = 44.58$, $SD = 19.69$. Within the age group 18-30 years old (36.5% of the total sample), 57,1% were women and 42.9% were men. The age group 31-50 had 23.4% of the participants, with 65.5% of these being women, and 34.4% being men. 28.1% was in the age group 51-70, with 51.9% women and 48.1% men. The last age group, 71-100, were 12.0% of the total sample, and consisted of 47.8% women and 52.2% men. For education, $M = 2.64$, $SD = 0.65$, 4.4% of the participants had only mandatory education, 32.6% had high school as their highest education, 58.1% had university as their highest education, and 4.9% had some other form of education as their highest. For income, $M = 2.57$, $SD = 1.16$, 24.0% reported their income as "a lot less than average", 21.6% reported their income as "slightly less than average", 31.5% stated their income as "average", 19.0% reported that their income was "slightly above average", and 3.9% stated that their income was "a lot more than average".

Procedure

The goal when collecting data was to get a sample from the population in Trondheim city. It was decided to collect data in two different shopping centers in Trondheim, City Syd and Torget. Participants were approached by the students and provided with information about the project, its' goal to investigate peoples transport intentions, that it would take about ten minutes to fill out, and that it was completely anonymous. Those who agreed to participate did the surveys online in the shopping centers on iPads provided by NTNU. Since the

response rate was lower than what was desired, especially in the age group 31-50 and for men in general, it was decided after a while that in order to get enough participants, the students conducting the data collection could also distribute the survey online to friends, acquaintances and others within the age groups and gender where data was most lacking. Thus, the study ended up with both a convenience sample and a snowball sample.

Instruments

The questionnaire consisted of several parts, where most of the questions could be answered within a Likert scale. The first two questions asked for the participants' consent to participate in the study, and that their information could be used until the projects was done. The next question asked the participants that, if they assumed that they had access to an electric bike, to what extent would they like to use them in urban trips in the future (post-Covid era). The participants then rated how much they would want to use an electric bike on a scale from 1 (never) to 9 (almost always).

The next part of the survey aimed to measure how important different psychological factors were when choosing transport modes. The participants were asked: "How important are the following aspects of transport when you select a transport mode?". Several quality attributes, such as safety, comfort, stress, flexibility, environmental friendliness, and travel speed were listed, and the participants were to rate how important these aspects are to them, on a scale from 1 (very unimportant) to 5 (very important), with 3 being the neutral option.

The last part of the questionnaire focused on sociodemographic and socioeconomic variables. The first question asked for the participants' gender, where one could choose between "woman", "man", "other" and "I do not wish to answer". The next question asked for the participants age, where the participants could place their age on a scale between 0 and 100. After this, the participants were asked what their highest level of education is, where they could choose between "mandatory school" (grade 1-10), "high school" (grade 11-13), "university" and "other". The next question asked: "How is your annual income compared to the average in Norway (587,600 NOK)?". Here, the participants could place their answer on a scale from 1 to 5, where 1 is "a lot less than average", 2 is "slightly less than average", 3 is "average", 4 is "slightly above average" and 5 is "a lot more than average. After this, the questionnaire ended with the question "Do you have access to a car?", where the participants could answer either "yes" or "no".

Statistical analyses

The data was analyzed with IBM SPSS Statistics 27. The variables that measured psychological factors were reduced to fewer components with a PCA. To find how much the different sociodemographic and socioeconomic variables and the new psychological components could predict electric bike use, a hierarchical regression analysis was conducted. In this analysis, the intention to use an electric bike was the dependent variable, and the sociodemographic, socioeconomic, and psychological variables were independent.

The variable “gender” originally had the number 1 for women and 2 for men, but this was changed so that 0 was for women and 1 for men, making it a binary variable. The scale variable “age” was also used to make a new categorical variable where the participants were sorted into four age groups: 18-30, 31-50, 51-70 and 71-100. To conduct the hierarchical regression analysis, the variables education and income were dummy coded into binary variables. For education, those who reported completed university education were sorted into the new category "higher education", which was coded as 1, and the other categories, "mandatory", "high school" and "other", were sorted into the new category "basic education and other", coded as 0. For income, the alternatives “a lot less than average”, “slightly less than average” and “average” were sorted into the new category “average or less”, and coded as 0, and the alternatives “slightly above average” and “a lot more than average” were sorted into the category “above average”, coded as 1.

Dimensionality and reliability of the measurement instruments

A PCA was conducted to check if the variables that measured psychological factors could be reduced into fewer components. An oblique rotation was chosen using direct oblimin in SPSS, since the variables correlated with each other. KMO was .661, and Bartlett’s test of sphericity was significant, $p < .001$, which meant that a PCA was an appropriate method to use (Field, 2018). Based on Kaiser’s criteria for eigenvalues at 1.0, five components were suggested. The scree plot was a bit more ambiguous, but the most natural number of components here was also five. Since some of the variables loaded above .3 in more than one component, the variables “reliability”, “travel time”, “environmental friendliness” and “protection from bad weather” was removed from the PCA. The five new components were made from a total of 13 variables. The first one was made out of four variables, and was called “User friendliness”. The second consisted of two variables, and was named “Physical activity”. The third one,

“Security and comfort”, consisted of three variables. The fourth, “Status”, consisted of two variables. The last component was made out of two variables, and was named “Economical and emotional load”. These five new components could explain 66.11% of the total variance in the variables.

To check the reliability of these new components, a Cronbach’s alpha test was conducted. The component “User friendliness” had a moderately high reliability, $\alpha = .686$, and didn’t get any more reliable if any items were deleted. The component “Physical activity” had a very high reliability, $\alpha = .863$, and could not have any items removed since it only consisted of two. The component “Security and comfort” had a high reliability, $\alpha = .742$, and would be slightly higher if one item was removed. It was decided not to remove the item, since the difference between the two numbers was very small. The component “Status” had a low reliability, $\alpha = .381$, and the component “Economical and emotional load” also had a low reliability, $\alpha = .325$.

For the components with just two items, a correlation analysis was also conducted as an additional way of checking the reliability between the items. The component “physical activity” had a high, significant correlation between the items, $r = .76$, $p < .001$, and therefore had a high reliability. The component “Status” had a low, significant correlation between the items, $r = .24$, $p < .001$, therefore having a low reliability. The last component, “Economical and emotional load”, had a low, significant correlation between the items, $r = .20$, $p < .001$, therefore this component also had a low reliability. The two components with low reliability, “Status” and “Economical and emotional load”, were consequently not included in the following regression analysis.

Table 1

*Summary from PCA on psychological factors (*N = *384)*

	User friendliness	Physical activity	Security and comfort	Status	Economical and emotional load	Communalities
Travel speed	**.76**	-.03	.12	.17	-.01	.60
Convenience	**.73**	.08	-.01	.02	.02	.55
Accessibility	**.68**	.03	-.12	.05	-.13	.50
Flexibility	**.67**	-.11	.01	-.25	.23	.60
Physical activity	-.01	**-.94**	.03	.04	.03	.88
Fitness	-.03	**-.93**	-.02	-.01	.00	.87
Safety	-.12	-.03	**-.90**	-.07	.03	.79
Security	.12	-.09	**-.80**	-.04	-.15	.72
Comfort	.04	.08	**-.67**	.15	.29	.61
Self-presentation	.04	.02	.12	**.82**	.15	.70
Novelty	.10	-.15	-.29	**.61**	-.15	.58
Costs	-.08	-.00	.02	.21	**.74**	.57
Stress	.17	.01	-.12	-.21	**.71**	.63
Eigenvalues	2.89	1.99	1.44	1.20	1.08	
% of variance	22	15	11	9	8	
Cronbach's α	.69	.86	.74	.38	.33	
Total variance					66.11	

Note. Component values higher than 0.4 are marked in bold. The extraction method used was Principal Component Analysis, rotated with Direct Oblimin with Kaizer's Normalization.

Results

Table 2

*Descriptives for sociodemographic and socioeconomic variables (*N=*384)*

Variable	Min	Max	M	SD
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

To find out how well the intention to use an electric bike could be predicted by the sociodemographic and socioeconomic variables age, gender, education, and income, and by the psychological factors user friendliness, physical activity, and security and comfort, a hierarchical regression analysis was conducted. For all the variables, tolerance was around .8 or .9, which is high above the preferred criteria at .2, and VIF was slightly above 1.0, which is well below the maximum criteria at 10, thus collinearity was not an issue (Field, 2018). The sociodemographic and socioeconomic variables age, gender, education, and income (block 1) predicted 2.6%, R^2 =.03, p = .008, of the variance in the intention to use electric bikes, and it increased to 2.7%, ΔR^2 = .01, R^2 = .03, p = .336, when the psychological factors were added (block 2). In block 1, age was the only predictor that was significant, β = -.19, p < .001. The other predictors in this block, gender, β = -.04, p = .478, education, β = .02, p = .755, and income, β = .04, p = .500, were not significant. In block 2, age was again the only significant predictor, β = -.22, p < .001. The other predictors, gender, β = -.03, p = .637, education, β = .02, p = .716, income, β = .03, p = .553, user friendliness, β = .07, p = .195, physical activity, β = -.07, p = .228, and security and comfort, β = -.01, p = .931, were not significant.

Table 3

*Summary for hierarchical regression analysis on predictors for electric bike use (*N = *384)*

Variable	B	SEB	β	Sig.	R^2	ΔR^2
Block 1					.03*	.04*
Gender	-0.20	0.29	-0.04	.48		
Age	-0.03	0.01	-0.19**	.00		
Education	0.09	0.29	0.02	.76		
Income	0.24	0.35	0.04	.50		
Block 2					.03	.01
Gender	-0.14	0.30	-0.03	.64		
Age	-0.03	0.01	-0.22**	.00		
Education	0.11	0.29	0.02	.72		
Income	0.21	0.35	0.03	.55		
User friendliness	0.19	0.14	0.07	.20		
Physical activity	-0.19	0.15	-0.07	.23		
Security and comfort	-0.01	0.15	-0.01	.93		

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

Discussion

The hierarchical regression model as a whole was only significant in block 1, not in block 2, and could only explain 2.7% of the variance in the intention to use electric bikes. There was only one significant variable, age, which contributed to the model being significant in block 1. With the addition of more insignificant variables in block 2, the model became less significant. This means that most of the sociodemographic, socioeconomic, and psychological variables couldn't predict the intention to use electric bikes well in this study. In the following paragraphs, the results for each variable will be discussed in relation to the hypotheses and the previous research on the area.

Age

In both blocks in the hierarchical regression analysis, age was the only significant predictor for the intention to use electric bikes. The results showed that age was negatively correlated with the intention to use electric bikes, which means that younger age could better predict wanting to use an electric bike than older age. This contradicts the hypothesis, which was that older age will positively predict the intention to use electric bikes. This was a surprising find, since it also contradicts most of the current research on the area. One explanation to this could lie in the study from Kunming and Shanghai, where it was found that the usage of electric bikes increased with age up to a certain point, then decreased with older age (Cherry & Cervero, 2007). The reason for this decrease for the eldest participants was suggested to be because the elderly generations in China are generally more reluctant to adopt new technologies, and to stop using traditional transport modes that they are used to. This could perhaps be an explanation for the results in this study as well; if the older participants were content with the transport modes that they are using, perhaps they also were reluctant to start using new transport modes and technologies. On the other hand, younger people, who are used to adapting quickly to new technologies from a young age, could perhaps be more open to using a newer transport mode such as an electric bike.

Another explanation could lie in the sample. In the age group 71-100, 87.0% had access to a car, and in the age group 51-70, 93.5% had access to a car. In the age group 31-50, 90.0% had access to a car, but for the youngest group (18-30), only 51.4% had access to a car. As we see

here, for the older age groups, the large majority of the participants had car access, while only half of the youngest age group had access to a car. When you are used to the comforts of using a car for your urban trips, using other modes could perhaps be less tempting.

Another reason could be that older people may have more difficulties using modes that require more physical exertion. Even though an electric bike requires less strength and stamina than a normal bike, it could still be taxing compared to using a car or the bus, for example. This is similar to what was found in the study from Denmark by Haustein and Møller, where it was found that both the possible involvement in accidents and the heavy weight of an electric bike made it less attractive for elderly people to use (Haustein & Møller, 2016). Furthermore, young people who live by themselves would perhaps have no problems with using an electric bike. Older people on the other hand, especially those with children or bigger families, who would need to be able to pick up people from different places and also be able to do bigger errands like getting groceries for many people, would have a difficult time doing all this with an electric bike and not a car, thus making an electric bike less attractive to use.

Gender

Gender was not a significant predictor in either of the blocks in the analysis. The hypothesis for gender was that the intention to use electric bikes would be predicted as higher for women than men, but with no significant results, this hypothesis was not confirmed. That means that gender had no significant influence on the intention to use electric bikes, which also contradicts much of the current research. Although the current research area was very divided in whether there where more men or women who wanted the most to use electric bikes, most of the studies reported some gender difference. But one study conducted in Norway found that gender had no significant effect on the intention to buy an electric bike (Simsekoglu & Klöckner, 2019a). Although they measured buying and not just using an electric bike, the results are still very similar. This can perhaps be due to differences in gender equality in the different countries and cultures where studies on electric bikes have been conducted. Norway is generally seen as a country with low gender differences and with strong egalitarian values (Teigen & Wängnerud, 2009). Other countries where research on electric bikes have been conducted, such as China and Australia, have bigger gender gaps in several areas, and changes towards gender equality are slow (Kulik, 2022; Lee, 2012). Therefore, it may not be

that surprising that Norway has less gender differences also in the intention to use electric bikes compared to countries with generally greater gender gaps. An example of how this could take place could be that in some countries, electric bikes are perhaps marketed more towards a specific gender.

Education

Education was not significant in either of the blocks, thus not confirming the hypothesis, which stated that the intention to use electric bikes would be positively predicted by higher education. This contradicts the current research on the topic, where high education often is correlated with a higher intention to use electric bikes. One study by Cherry and Cervero however, found that there was no significant relation between electric bike use and education level (Cherry & Cervero, 2007). In this study, it is suggested by the researchers that education could be related to income. Even though an electric bike is relatively expensive, and therefore perhaps more attractive to people with higher education who also have a higher income, the cost is still substantially lower than several other transport modes such as cars. This possible explanation will be further discussed later, in the paragraph on income.

Another explanation could lie in the simple fact that "lower" education doesn't necessarily mean a lower income. There are many jobs who doesn't require higher education, or who rather would want people with work experience and/or a certificate from a vocational school, who could very well have the same or even a higher salary than many jobs you would need a university degree for. The same goes for university educations; some degrees can possibly lead to very high salaries, and others will most likely not be that high, especially for jobs in for example healthcare or different social services. When having this in mind, one can see how education, at least when related to income, can't necessarily predict wanting to buy or use an electric bike. Education alone could have possible other explanations, especially if other, unknown factors affect it, but this remains little explored in the current research.

Income

Income was not a significant predictor in both blocks. These results cannot confirm the hypothesis, which said that the intention to use electric bikes would be positively predicted by higher income. This also contradicts much of the existing literature on the topic. A reason for

this could be found in the previously mentioned study by Cherry and Cervero on use characteristics and mode choice behavior of electric bike users in China, where income also was not a significant factor (Cherry & Cervero, 2007). The researchers here suggested this could be because of the relative low cost of buying and maintaining an electric bike. Unlike for example having a car, which requires large sums of money to both buy and maintain with gas and eventual reparations, an electric bike mostly requires just a one-time sum out of pocket, and then maintaining it is just a relatively small addition included in the monthly electricity bill, and the eventual price for a new battery if you have to change it. So even though buying an electric bike is more expensive than buying a normal bike, it could be potentially much more attractive for someone with a relatively low income, compared to a car. This could explain why higher income is not necessarily always positively correlated with the intention to buy or use an electric bike.

User friendliness

User friendliness was not significant in either of the blocks in the hierarchical regression analysis, which means that the hypothesis, that said that the intention to use electric bikes would be positively predicted by user friendliness, was not confirmed. Although there was not much research on this factor, the research that existed mostly found that factors related to user friendliness, such as flexibility and travel speed, was positively correlated with the intention to use electric bikes. The results from the regression analysis therefore contradicted the previous studies on the subject. There could be different reasons why the factors included under user friendliness possibly isn't that important to people who would want to use an electric bike. The travel speed of an electric bike would, although it certainly would be faster than a normal bike, still not necessarily surpass that of a car or the bus, especially when taking traffic into consideration. Cycling longer stretches is one thing, but in the more crowded city center, where one would have to stop for pedestrians, car users and even other cyclists, in addition to following lower speed limits than outside the city, the overall travel speed would not necessarily always be faster than other transport modes. Factors such as convenience, accessibility, and flexibility, could also have little to no influence on the intention to use electric bikes if an electric bike perhaps doesn't stand out as being considerably better in these areas. If using a car, the bus, or even a normal bike is perceived as about the same amount of flexible, convenient, and accessible as an electric bike, there would be no reason for these factors to influence users into wanting to use an electric bike more. Overall, if other transport

modes seem just as user friendly for the participants, it would make sense that user friendliness doesn't predict the intention to use an electric bike that well.

Physical activity

The variable physical activity was not significant in both blocks. These results did therefore not confirm the hypothesis, which stated that the intention to use electric bikes would be positively predicted by physical activity. It also contradicted most of the current research. However, a study from Norway by Simsekoglu and Klöckner found that although physical activity and health was positively correlated with the intention to use an electric bike, it still was a weaker predictor than other factors, such as symbolic and mobility benefits (Simsekoglu & Klöckner, 2019a). This effect was suggested by the researchers to be because some people perhaps associate using an electric bike with less physical activity than a normal bike, and that it therefore is just meant for people who, for example because of their physical limitations, cannot use normal bikes. In Fishman and Cherry's study on this topic, it was found that using an electric bike did in fact result in a lower physical activity level compared to using a normal bike (Fishman & Cherry, 2016). This could explain why people who care more about being physically active in their transport habits don't want to use an electric bike as much as for example a normal bike, or why the people who do want to use an electric bike, don't do it as much for physical activity reasons.

Another reason to why physical activity couldn't significantly predict the intention to use electric bikes, could be because of the participants' transport and exercise habits. Although it wasn't measured in the questionnaire, a lot of the participants talked while answering the survey. Several of them wanted to clarify that although they thought of physical activity and health as important, this didn't influence their transport habits. They preferred to have exercise and transport as two separate spheres in their lives, not as something they did simultaneously. This could explain why many didn't report physical activity as very important for them when choosing a transport mode, and why physical activity consequently didn't turn out as a significant predictor.

Security and comfort

The last variable, security and comfort, was not significant in either of the blocks in the hierarchical regression analysis. This means that the hypothesis, which stated that the intention to use electric bikes would be positively predicted by security and comfort, was not confirmed. There was not much research on this topic, but it seemed like electric bike users as a group in general consisted of all ranges of safety behaviors. As it was discussed earlier in the thesis, this could explain why security and comfort wasn't a significant predictor; electric bike users, just as users of normal bikes, consists of people with all kinds of attitudes towards safety, and that even though these attitudes could predict things such as the occurrences of traffic rule violations or accidents, it can maybe not as much predict the intention to use electric bikes in itself.

Another explanation could perhaps be found in how the participants rated the variables safety, $M = 4.31$, $SD = 0.94$, and security, $M = 4.35$, $SD = 0.91$. We can see that the means in both variables are on the high end of the scale between 1 and 5, somewhere between "somewhat important" or "very important". This could mean that safety and security is generally very important to the participants, and that it is not a distinctive feature just for the people who would like to use an electric bike. Therefore, safety and security could not predict well the intention to use electric bikes.

When looking at the comfort variable, $M = 3.72$, $SD = 0.90$, one can see that the mean is now closer to the middle option 3 on the scale, which was the more neutral option. This could mean that the participants generally didn't think of comfort as that important when choosing a transport mode, and consequently why it contributed to making the component as a whole not predict the intention to use electric bikes well.

Limitations

There are several limitations to the present project. The sample was both a convenience sample and a snowball sample, something that could mean that the sample was not entirely random, and thus not representative for the whole population in Trondheim or Norway. An example of this could be that one of the shopping centers, City Syd, had a placement far from Trondheim city center, and did not have many neighborhoods nearby. Consequently, most of the people who came to City Syd at the time of the data collection most likely came by car. This could perhaps influence how high their intention to want to use an electric bike was, for example if they are very used to and content with using a car. The data collection also happened between 10:00 and 16:00 Monday to Thursday, a time where a large portion of people are either in school or at work. This could have influenced the results in that some groups, like retired people, people on holiday, people with either no current job or who works at different hours, for example night shifts, or younger people who were finished at school or university for the day, where more likely to be present than groups who were more likely to be at work. A solution here could be to do research on these different groups and see if there are any differences between them that could influence how they responded to the survey, or to conduct a similar study with a more randomized sample.

Another limitation to the project was that the anonymity for many of the respondents were broken, since several wanted to have the questions read aloud to them and filled out for them. The fact that another person could see what they answered could have influenced how they responded in several of the questions. One example could be the question about income, where the most people stated their income as average or lower. This could be because the respondents' incomes in fact where generally lower than the average, or because people were hesitant or unwilling to seem like they wanted to brag about their income when answering, therefore stating it as lower than it actually is. There is no way to know for sure, and the fact that many of the respondent were retired and thus lived on a lower income through their pension, could on the other hand suggest that a lower mean in income is correct.

It was also noticed when collecting the data that some of the questions where relatively often misunderstood. One example is the first question, where the participants were to imagine that they had access to an electric bike. Instead, many interpreted the question as how much they used an electric bike now, and, since many did not have an electric bike, they answered that

they never would want to use one. For the participants that had the questions read aloud and filled in for them, it was possible to explain the questions in detail to avoid confusion. But for the many people that filled the survey out themselves, it is possible that these questions where misinterpreted. In the example of the question about electric bikes, it is possible that this could have led to seemingly less people wanting to use an electric bike than it perhaps actually was.

Implications

The present bachelor's project found few significant results, and most of it contradicted the current research on the area. Therefore, further research should aim to explore these results more, and see if they are either specific for this project, or if they are showing a more general tendency in people's transport habits and intentions to use electric bikes in Trondheim or Norway. This could be done for example by having a sample that's bigger and more diverse, preferably as representative for the population as possible, and by controlling for even more factors that can possibly influence the intention to use electric bikes. It is also possible that the results would be different some years in the future, when electric bikes perhaps are more commonly used and seen in people's daily lives than today. This could perhaps have the effect of people considering it more as a reasonable transport mode equal to other modes such as cars, normal bikes, and buses, and not just a rarity seen occasionally, but this would have to be investigated later to know for sure.

Since many of the results differed from previous research conducted in other countries and cultures, it could be interesting to study the difference in intention to use an electric bike, and possible factors that can influence this, between different cultures around the world. In that way, one can compare those results with what was found in this project, and then possibly get more knowledge about the cultural similarities and differences in electric bike use between Trondheim and Norway as a whole and other countries and cultures.

To help understand what makes people want to use electric bikes further, it could also be beneficial for policy makers, traders, and others if more studies are conducted in Norway, both in Trondheim, other Norwegian cities, and Norway as a whole, where one focuses on the specific obstacles that people experience that prevents them from using an electric bike. If this

includes both good quantitative data, and qualitative studies on the participants' thoughts and possible solutions to these obstacles, one could possibly get a much broader and detailed picture on what influences the intention to use electric bikes, and how to accommodate for more electric bike use.

Conclusion

This bachelor's project found one variable, age, that could significantly predict the intention to use electric bikes, and none of the hypotheses were confirmed. However, the project then got the chance to explore alternative reasons and factors that could influence the intention to use electric bikes, something that could contribute to the current research, which still has much left to explore. Electric bikes are still in an early start-up phase in Norway compared to many other countries, where they have been a common transport mode for several years. Doing more research on this topic could therefore help people understand how to better accommodate for electric bike use, something that could be beneficial both for the users' economy and physical health, as well as for the local and global environment.

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