Socio-Psychological Predictors of the Use of Public Transport

Candidate number: 10023

PSY2900 Bachelorfordypning i psykologi

Norwegian University of Science and Technology (NTNU)

Trondheim

Spring 2022

Supervisor: Milad Mehdizadeh

TABLE OF CONTENTS

PREFACE

This research project is about social-psychological factors and how they influence the choice of public transport as transportation mode. The project was structured, presented and counciled by the supervisor, Milad Mehdizadeh. The research project, being a bachelor project, was called «BA11-Socio-psychological predictors of transport mode use». There were 8 students working on this bachelor project this semester. For this thesis I followed American Psychological Association (APA) 7th edition, 2020.

The research questions and hypotheses for my bachelor thesis was based upon previous research and social-psychological theory. The previous research used for this thesis were based on my own research and what I wanted to find. I also received help with finding research papers for previous findings from the supervisor. The ideas in this thesis are my own.

I would like to thank the students in my bachelor project group. They were of great help and support, and provided useful and helpful guidance. I would especially like to thank two of my fellow students, Thea Asmaro and Oda Marie Mentzoni Skjervold, who helped me the most. Mostly near the end of the project when I felt like I had all these stupid questions, and they did not seem bothered by it. I would also like to thank my boyfriend, Jakob Lie Eriksen, who kept encouraging me, and who helped me finish and complete my thesis.

I wish to thank the two assistants of the bachelor project, Per Helge Haakstad Larsen and Matilde Flåten. They provided helpful guidelines, tips and tricks. They also made the learning experience a lot easier. They were patient and always available. Finally, I would like to thank the bachelor project's superviser, Milad Mehdizadeh. He helped me by guiding me in the right direction. He proposed helpful ideas, and helped me formulate my research questions. Having all of this said, I declare that this thesis is my own.

Word count: 8351

ABSTRACT

Public transport is an environmentally friendly and sustainable alternative in the decision making process between transportation modes. This study will attempt to find possible desireable aspects of public transport, to promote the use and further improve the climate and environment. The research questions for the thesis are «*What are the roles of social demographic variables when choosing public transport as transportation mode? And what are the roles of quality attributes in this choice?*» The study is based upon the results of a hierarchical regression analysis, where as the data used are the answers from an anonymous questionnaire. The results from the analysis proved three of the hypothesises of the thesis correct. This study showed that the most important factor for promoting public transport was environmental friendliness. Environmental friendliness proved to have a positive correlation with the use of public transport, meaning public transport is most likely viewed as environmentally friendly. With both previous research and socio-psychological theories as backup, environmental friendliness could help promote the use of public transport. For later research, studying factors for promoting public transport to people who are proven to be less likely to use it, like elderly people or people with high income, would be rather interesting.

INTRODUCTION

1.1 Actualisation

Public transport is a very frequently used tool in the everyday life of a large part of the population (Rothe, 2022). In addition, the offering of public transportation is getting increasingly better via multiple improvements and new findings in technology. Public transport is an environmentally friendly and sustainable mode of transportation, as the vehicles are large, fit a larger amount of people than in for instance a car. It is also a transport mode that for many is relatively easy to use, and is becoming increasingly so. The usage of public transport is an important field for research, in order to find methods and tools that may be utilized in order to improve the modes of public transport, and through this improve the number of citizens using them, and through this again improve the positive effect on the environment even further. One instance where research on this subject could be of great importance could be in certain areas with a lesser population density, where there previously have been struggles in order to establish a well-functioning offering of public transport. Research on this field may cause those areas that may not have well-functioning public transport per today, may have the ability to establish such an offering in the future, also outside big city centres. One way to aid in the establishment of such offerings through a study such as this one, may be to highlight factors that are positive towards the use of public transport. Another benefit that may appear as a result of these forms of research, could be that the general way public transport is being created and operated from day to day may improve based on the data that is found, which may result in a better offering, which might again lead to customers being willing to pay more for an offering that is functioning on a higher level than previously.

1.2 Explaination of terms

Social demographic variables and quality attributes

This bachelor thesis will revolve around and focus upon my research on sociodemographic variables and quality attributes. Demography is the study of a population (Solerød & Tønnessen, 2022). Sociodemography is therefore the study of the social aspect of a population. In the questionnaire that was established in order to be used for this assignment I

focused upon sociodemographic variables such as age, gender, economy, and yearly income. Quality attributes are defined here as variables that measure values, attitudes and thought-patterns. These are variables that measure what is most important to each and every single individual. Quality attributes that have been included in this thesis are safety, convenience, accessibility, physical activity, self-presentation and more. Quality attributes will in this thesis be sorted, and be assorted into four larger groups known as components. The assorting of attributes into components will be done through a process called Principal Component Analysis (PCA).

Bandura's theory of social learning

Social learning theory is a form of psychological theory that attempts to explain how humans learn and adapt to new knowledge and skills through observing, interacting and adapting to other humans in various social settings (Raaheim, 2019). Albert Bandura is known as the main researcher that established this theory. Bandura practised his research based upon multiple theories of learning through observation in multiple studies on children's development. Social learning theory is based upon human's inclination to be influenced and affected by all and everything that surrounds us, both consciously or unconsciously as well as willingly or unwillingly. For instance, social learning theory could revolve around an individual altering their patterns of behaviour or thought, in order to adapt to a specific social environment. This could be an unconscious process, that is happening through continuous repetition or imitation of behaviour and way of being based upon the behaviour that is displayed by the others in the group, and little by little internalizing these differences and making them one's own. Social learning theory might also be as simple as children imitating their parents or siblings. Children process and observe a lot of data and input through observations in their everyday lives, and a lot of this data is incorporated and adapted into knowledge and skills, often unconsciously. Social learning theory revolves around the constant input we get from our environment, and that this input might alter the way you act, think and behave gradually, and over longer periods of time.

Conformity

Conformity is a psychological phenomenon that unravels the reshaping of our thoughts and behaviour as a consequence of perceived pressure from others in a social group (Gilovich et al., 2018). Conformity is how individuals strive to fit in with the social group because there is an, in some cases, only perceived, in other cases very real pressure to do so. This reshaping is sometimes an unconscious action, and in others a conscious choice, dependent on the given situation. Solomon Asch researched this phenomenon through his famous experiment that involved one test subject, multiple actors, and a set of drawn lines on a piece of paper (Gilovich et al., 2018). Asch told the test subjects and actors they were going to be put through a visual test. The participants were shown a given number of drawn lines next to each other, and one separate line besides all the others. Every participant was then to point out which line that had the exact same length as the line that stood on the outside of the others. The actors answered first, and they were instructed to actively pick the same line, and that this was to be one of the lines that quite blatantly obviously was not the same length as the lonesome line. Since the actors all delivered the same response, which also happened to be the wrong answer, before the real test subject was allowed to give their answer, the test subjects appeared to perceive a pressure to select the same line as the others, even though their intuition told them it was not the correct answer, and then continued to select the wrong line, therefore overruling their own judgement in order to conform to the group's decision. This experiment was performed multiple times, and eventually one of the actors was instructed to alter their answer, and occasionally give the correct answer. This did in many cases lead to the real test subject also providing Asch with the correct answer. Asch's experiment therefore showed that unless the test subject had another member of the group that supported their decision, it would in most cases prove very hard for the test subject to give a different answer to the others in the group and thereby stand out and break conformity.

1.3 Previous research

Predictors of public transport use among university students during the winter: A MIMIC modelling approach (Nayum & Nordfjærn, 2021)

This study was based out of two of the main campuses at the Norwegian University of Science and Technology in Trondheim, Gløshaugen and Dragvoll. The participants were students between the ages of 19 and 30 years old. The study was performed in the time-period

of February to April in 2018. This study revolves around the prerequisites for choosing one's transport mode, and thereafter comparing the results with psychological theories such as Theory of Planned Behaviour (TPB). The study showed that prior intentions and perceived behavioural control had an effect on the selection of transport mode. The perceived behavioural control may also have been affected by the sensation of experienced ability to act, in cases of poor weather for instance. The experienced ability to act is therefore situationally determined, and hence the selection of transport mode may also be situationally determined.

This study also explains how humans may influence and affect each other, through theories such as Social Influence Theory by Kelman, and Social Learning Theory by Bandura and Walters. Social influence may shape and form an individual's core values, sentiments, thoughts and actions. In addition, by observing other members of a social group one may adopt and indoctrinate social norms and values that are of relevance to the group. The study utilizes these two theories in order to explain the popularity of environmental friendliness in social environments such as universities. Values, norms and attitudes are contagious. The surge in perceived importance of environmental friendliness may strengthen the argument for opting for sustainable modes of transport, such as public transport.

The researchers also emphasized the influential power of social status and perceived probability of accidents in the study. Here the study found that perceived probability of accidents and the bias that public transport is mainly used by individuals of a lower social status, had a negative effect on attitudes towards public transport. This view concerning usage of public transport in correlation to lower social status was however found most frequently in older parts of the student population and in males.

During the review of the study researchers found that some the factors of the highest relevance and importance in order to promote public transport, based upon the data that was gathered from the population of students at Dragvoll and Gløshaugen, the combination of perceived ability to act, perceived behavioural control, intention, social influence, environmental friendliness and sustainability, as well as security and social status were all important factors. The three that proved of the highest importance to this study was environmental friendliness, security, and social status. In addition, the article concluded that individuals are afflicted by their perceived control and social relations.

The role of attitudes, transport priorities, and car use habit for travel mode use and intentions to use public transportation in an urban Norwegian public (Şimşekoğlu et al., 2015)

This study directed their spotlight to the larger cities in Norway, such as Tromsø, Bergen, Oslo and Trondheim. The study managed to sample 1039 participants, whereas all the participants were at least 18 years of age. The study took place in the timespan in between June and August of 2013. The study targeted habits on the usage of personal vehicles, more specifically cars. The intention behind this was to investigate if use of public transport and variances in priorities when it comes to choosing one's transport mode. For instance, this study found out that individuals with a strong habit of frequent car usage were more likely to use their car as their transport mode, perhaps at the cost of the frequency of how often they utilized public transport.

The study found that there are multiple cases of negative biases towards usage of public transport in the parts of the population that are frequent car users. For example, the study cites that some car users often view public transport as a practical liability, especially when travelling with children. In addition, the researchers emphasize that there is a clear tendency that car users associate the usage of public transport to one's social status to a far larger extent, than the association perceived by users of health-promoting transport modes. The usage of car as one's transport mode was perceived as prestigious, and according to the data from the study, the usage of public transport was associated with a lower social status.

Other important factors the study found regarding the decision of utilizing a car rather than public transport, was amongst other variables, flexibility, efficiency and time consumption. The study states that individuals with a high yearly income often inherit demanding jobs and working hours, which may indicate that the inefficiency of public transport could assert quite an obstacle for the given individuals. Therefore, the article claims that there is a correlation between above average yearly income, and the probability of choosing a car over public transport. Another interesting find in this regard, is that individuals that value flexibility more than average, is more often likely to have a lower tolerance for having public transport promoted to them. Statistics also show that public transport in general is viewed as a safer option than a personal car, but that this might be caused by higher percentages of car accidents being reported, than accidents that involve modes of public transport.

The main findings of this study, is that in order to promote the usage of public transport, one must focus on a few certain aspects. In order to increase flexibility and efficiency there should

be more frequent departures from the bus-stops. There should also be a reduction in both frequency and duration of delays. It could also be beneficial to promote the safety aspect of public transport, since this is something in which the population already associated with this transport mode. Attitudes also proved to be an important factor, and therefore a general improvement in the public's attitude towards public transport would with high probability be beneficial.

The role of transport priorities, transport attitudes and situational factors for sustainable transport mode use in wintertime (Egset & Nordfjærn, 2019)

The selection represented in the data for this study are university-students from the two largest campuses in Trondheim, Gløshaugen and Dragvoll. The selection consists of 441 participants. The study took place in the timespan in between February and April of 2018. The study researched how transport priorities, attitudes and the given situation affect the decision-making process of selecting an environmentally friendly transport mode in the winter season. The main focus-point of the study is the decision between an active transport mode, like biking or walking, versus a form of public transport.

This study found evidence that there is a substantial correlation between attitudes and preferred transport mode. The researchers found that the majority of the factors were in favour of active transport, rather than public transport. First and foremost, and maybe obviously to some, the researchers found that individuals with an interest in physical exercise and health were further inclined to opt for active transport. In opposition to some of the other studies that have been included in this bachelor, this study concluded that individuals that cared for the environmental friendliness of their transport modes, chose to utilize active transport, rather than public transport. Flexibility was also a key factor for choosing active transport. The final find that was concluded upon in this study was that individuals that value comfort, often chose public transport over active.

The factors that enfolded in the favour of public transport according to this study were distance, and weather. The study found that there was a significant negative correlation between distance and usage of active transport, meaning that the greater the distance, the greater the odds that the individual would choose public transport for their journey. There was also a correlation between weather and transport, in the sense that if the weather appeared poor, the odds that the individual would choose public transport over active would increase.

1.4 Holes in previous findings

In a previous scientific article, there were multiple stated findings regarding usage of public transport compared to the usage of other modes of transport. Amongst other things, two articles had two completely different reports on the relevance of security. The article called *Predictors of Public Transport Use Among University Students During the Winter: A MIMIC Modelling Approach* by Nayum and Nordfjærn (2021) explains that the higher the perceived probability that individuals inherit as to their risk of being involved in an accident, the lesser are the chances for the said individual to choose public transport over other transport modes. Perceived accident involvement probability is therefore negatively correlated with the usage of public transport. It could therefore be argued that individuals who value security do not frequently make usage of public transport. Still, in the article *The Role of Attitudes, Transport Priorities, and Car Use Habit for Travel Mode Use and Intentions to Use Public Transportation in an Urban Norwegian Public* by Şimşekoğlu, Nordfjærn and Rundmo (2015), there is a statement that since there is such a high percentage-rate of reported accidents in cars, public transport is generally viewed as the safer option of the two. In this study the researchers use the argument surrounding car accidents in order to explain why there is an important correlation between the importance of security and usage of public transport.

That these two studies found two contradicting results in the correlation between value of security and usage of public transport, could be considered a valuable premise and starting point of this thesis. The study that was mentioned first, took place in Trondheim in the time period in between February and April of 2018, at NTNU's to largest campus sites, Dragvoll and Gløshaugen (Nayum & Nordfjærn, 2021). The lastly mentioned study took place in multiple of Norway's largest cities, in between the time period of June to August of 2013, and only took into consideration participants over the age of 18 (Şimşekoğlu et al., 2015). There are multiple points here that differentiate the two studies, and one might argue that this could be the reason as to why some of their findings are contradicting. First and foremost, the year may have affected the results. One could argue that there is a possibility that there has been changes in legislation regarding the usage of safety accommodations in public transport in the time period of 2013 to 2018, that led to more frequent usage of said accommodations. Viewed from a different angle, there is no certainty that what felt secure 5 years ago, still feel secure in 2018. Since the two different studies had such a long time-gap in between them, and they did not take place in the same geographical area, the population sample might have an effect

on the sampled results as well. In the first study from 2018 (Nayum & Nordfjærn, 2021), only students at NTNU participated. The age span of the participants varied from 19 to 30 years of age. In the latter study from 2013 (Şimşekoğlu et al., 2015), the age span was from 18 years and up, without an upper limit. It is a possibility that student's attitudes in general deviate from the mean in comparison to the population in general, since the students might have most of their social contact with other students of the same age and approximately same mind-set. In the latter study there were also included young individuals in the same age as the participants from the first study, but in the latter study the participants could also be any age above 30 as well, which may have induced the shift in direction that the results had found. There is also a possibility that students perceive public transport as less secure than what the older parts of the population do. This is hard to know for sure and conclude upon. In addition to this, the first study took place only in Trondheim, while the other study took place in multiple cities. One reason that the results varied might be that the students in Trondheim view public transport as less secure than what the population in other large cities in Norway do. To conclude there is many different reasons and variables that might explain why the results of the two studies are contradictive, and differentiate themselves from each other to such a degree, when it comes to the question of correlations between perceived importance of security and the usage of public transport.

Two of the articles that were used as previous research compared the utilization of public transport with the usage of another transportation mode. In the article *The Role of Attitudes, Transport Priorities, and Car Use Habit for Travel Mode Use and Intentions to Use Public Transportation in an Urban Norwegian Public* (Şimşekoğlu et al., 2015) there is a comparison between the use of public transport and the usage of cars. The article *The Role of Transport Priorities, Transport Attitudes and Situational Factors For Sustainable Transport Mode Use in Wintertime* (Egset & Nordfjærn, 2019) compared the use of public transport with the use of active transport. These two studies had different views on the correlation between the usage of public transport and the importance of environmental friendliness. The first study that compared the use of public transport with the usage of cars, found that individuals that valued the importance of environmental friendliness had a greater inclination to choose to utilize public transport. This means they found a positive correlation between the importance of environmental friendliness and the usage of public transport and a negative correlation between the importance of environmental friendliness and usage of cars. In the other study that compared the usage of public transport to the usage of active transport, the researchers

found that individuals that value the importance of environmental friendliness would rather use active transport than public transport. Active transport in this instance means either walking or riding a bike, or other forms of transport that involve a certain level of physical activity. In this study the conclusion was that there was a positive correlation between the importance of environmental friendliness, and the usage of active transport, and a negative correlation between the importance of environmental friendliness and the usage of public transport.

The fact that the two previously stated articles had different findings when it came to the correlation between the importance of environmental friendliness and the use of public transport, may have multiple reasons. Factors like difference in time period where the study was performed, geographical placement, sampled population and others affect the result in multiple ways. It could still be argued that the most important reason to the difference in reported correlations could be the potential comparisons, meaning that what the option one could choose instead of public transport might have an important effect on the result. One study said that environmentally friendly individuals would choose public transport over cars (Şimşekoğlu et al., 2015). The other said they would choose active transport over public transport (Egset & Nordfjærn, 2019). This does not necessarily need to be contradicting findings per say, even though the correlation itself is. The said correlation could also be situationally based. It could be a possibility that if all three different modes of transportation were introduced as a possible mode of transport the results could be different, for example mostly correlated with active transport, medium with public transport, and the least with the usage of cars. This is not something this thesis will continue to explore, but it could be an interesting topic for another study. This bachelor thesis will continue to target the importance of the correlation between the importance of environmental friendliness and the usage of public transport.

1.5 Research question

What are the roles of social demographic variables when choosing public transport as transportation mode? And what are the roles of quality attributes in this choice?

Hypotheses

1. Younger people are more likely to use public transport
2. People with higher annual income are less likely to use public transport
3. People bothered by long walking time are more likely to use public transport
4. People who value environmental friendliness are more likely to use public transport
5. People who value security are less likely to use public transport
6. People who value social status are less likely to use puplic transport
7. People who value practicality are less likely to use public transport
8. People who value comfort are less likely to use public transport
9. People bothered by poor weather makes it more likely to use public transport

1.6 Structure of the thesis

This bachelor thesis will do its research on a selection of attitudes and thoughts on and towards various transport modes, sampled by the usage of a customized questionnaire. The thesis will utilize quantitative methods of research with a PCA and a hierarchical regression analysis. First, the thesis will sum up the research that has been done. This part will explain the methods that have been used, as well as the decisions that were made underway of writing the thesis. Thereafter the thesis contains a part concerning the results. Here there will be a representation of the results that were gathered from the data, in various tables, and commentaries made on the said tables. After the results, there will be a discussion, where the findings of the previous parts will be discussed, as well as what the results can tell us more specifically. There will also be a discussion as to if the hypothesises that were made at the start of the thesis proved to be true, and the thesis question will be answered to the best ability given the findings that have been found and discussed. To summarize there will be a conclusion part, where there will be a short summary of the main aspects and findings of the thesis, as well as the final conclusions to the thesis question.

METHODS

2.1 Selection

This study is a cross sectional design. The selection that was made is made up of random participants of all age-groups. The participants were recruited during one week of February 2022. The selection was cut down, using multiple requirements in order to participate. The requirements were full consent to the use of the gathered data, an age over 18 years, and only females and males were taken into account. The number of participants that fulfil these requirements, and therefore ended up becoming the chosen selection, was 384. Of these, 217 (57%) were female, and 167 (43%) were male.

Level of education and yearly income was also measured as a part of the selection for this analysis. The question regarding level of education asked for the highest level of education the participant had completed, for instance primary school, high school or university. The question regarding yearly income asked for an estimate of the participants yearly income compared to the mean of yearly income in Norway (587 600 NOK).

View table 2 for descriptive statistics of the sociodemographic and socioeconomic variables.

2.2 Procedure

The data-set used in this analysis came from a self-administered anonymous questionnaire. The questionnaire was mainly answered at two shopping malls in Trondheim, Trondheim Torg, and City Syd. In addition, the questionnaire was sent over the internet to various individuals that were known to the researchers, through channels such as social media outlets such as Facebook. The selection was also affected by snowball sampling, since the link was passed on through multiple links of individuals across the internet.

2.3 Measurement instruments

The questions in the questionnaire that were used for this study was split into four groups. The first group was made up of 14 different transport modes, each with their own Likert-scale, with 9 levels, that was used to show the probability that the given transport mode was to be used by the given participant. The second group was made up of questions regarding quality attributes. The questions were regarding how important the various quality attributes were to

the individual, and each of the questions were given a 5-point Likert scale. The third group was contained questions regarding personal and social norms. Each of the questions were given a 5-point Likert scale, that was supposed to show to which extent the participant agreed to the stated fact on questionnaire. The stated facts could for instance be operationalized; «*My friends often ask me to give advice upon travel and transport issues*». The fourth group contained questions regarding background information. Here the target variables were of the sociodemographic or socioeconomic type, such as age, gender, yearly income, etc.

2.4 Statistical analyses

The computer program that was used for this analysis is IBM SPSS Statistics 27.

The variable *gender* was recoded into a binary variable, where 0 means female, and 1 means male. In addition, the variables *income* and *education* were dummy-coded, so that the answers either belonged in the category of high income, or low income. These variables were also given new names, *high income*, and *well educated*. In the questionnaire the operationalization of the alternative response to the question regarding *income,* were; a lot less (1), less (2), neither less nor more (3), more (4) and a lot more (5). These 5 values were dummy coded into 2. The variable was as previously mentioned renamed to *high income*, and given the values of either 0 or 1. All answers between 1 and 3 counted as 0 and therefore not as high income, and all answers of 4 and 5 were counted as 1 and therefore counted as high income. The variable education had the alternatives; primary school (1), high school (2), university (3) and other (4). Since "other" is not defined, it was coded alongside not high education. Therefore, the new variable was called *well educated*, where 0 meant the participant had answered 1, 2 or 4 and therefore did not fulfil the requirements for *well educated*. If the participant answered 3, the value was counted as 1, and the participant fulfilled the requirement for *well educated*.

A hierarchical regression analysis was performed in order to determine the correlation between the dependent and independent variables. Block 1 consists of sociodemographic and socioeconomic variables. Block 2 consists of the same variables, but in addition it contains four components derived from a PCA. The components from the PCA are called *well-being, practicality, physical activity* and *social status*. In addition to this, the variables called *environmental friendliness* and *protection from poor weather* were also included. View table 3 for the hierarchical regression analysis that was performed.

Multicollinearity appears if some predictor variables correlate to each other to the point where they no longer contribute with their own information to the regression analysis. In order to test the variables to avoid this, there was performed a variance inflation factor (VIF). The VIF score of the variables were alle in between 1 and 1.5, which means that the correlation between the variables was low correlation to no correlation. Multicollinearity will therefore not pose to stand an issue to this regression analysis.

2.5 Dimensionality and reliability of the measurement instruments

This study required the use of a Principal Component Analysis (PCA) in order to gather similar variables into fewer components. The variables called *reliability, travel time, environmental friendliness*, and *protection from poor weather*, were not included in the PCA, as they all had a charge of over .03, on multiple components. In addition, the component that contained *costs* and *stress* were removed, as it had a low score on the Cronbach's alpha. From the PCA there was derived four components, that were called *well-being, practicality, physical activity* and *social status*. All of the components had a Cronbach's alpha of > .6 except from *social status*. This component was still included in the article, because it is relevant in order to answer some of the hypothesises. In addition, Cronbach's alpha is not of relevance for a component made up of only two variables. There was therefore ran a Pearsons correlation analysis instead, for this component. The Pearsons correlation analysis of the two variables called *image/self presentation* and *novelty*, which together make up the component *social status*, showed a positive low to moderate correlation in the selection ($r(384) = .236$, $p < .001$). The result is deemed significant.

Table 1

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

	Well-being	Practicality	Physical activity	Social status	Communalities
Safety	**.91**	-.11	.03	-.09	.80
Security	**.78**	.09	.13	-.07	.69
Comfort	**.70**	.09	-.15	.19	.58
Travel speed	-.12	**.75**	.03	.16	.60
Convenience	.01	**.73**	-.08	.02	.54
Independence/flexibility	.01	**.73**	.04	-.17	.54
Accessibility	.11	**.66**	.02	-.00	.47
Fitness	-.03	.02	**.93**	.05	.87
Physical activity	.01	-.01	**.93**	-.00	.87
Image/Self presentation	-.13	.00	-.05	**.87**	.74
Novelty	.26	.01	.18	**.63**	.57
Eigenvalue	2.80	1.87	1.42	1.16	
% of variance	25.45	17.04	12.92	10.55	
Cronbachs α	.74	.69	.86	.38	
Total variance				65.95	

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

RESULTS

3.1 Descriptive statistics

The descriptive statistics of the analysis displays the largest and smallest value of both the social demographic as well as the socioeconomic variables in addition to their mean and standard deviation. This table displays how the age span of the participants were from 18 to 98 years, whereas the mean was at 44.58 years. In addition, the standard deviation is 19.69 years from the mean. The variable *gender* is recoded as binary variable where 0 means female and 1 means male. The mean is at 0.43, which means that even though the participant gender balance is relatively good, there is still a few more female than males that have participated in

the study. The standard deviation on this specific variable I 0.50, because the value is set between 0 and 1 no matter the data-input, so therefore the fluctuations will almost always be around 0.50.

The variables *education* and *income* were dummy coded so that they each got two values. Before the dummy coding *education* had four values, whereas 1 and 2 were considered "low education", 3 was considered as "high education" and 4 was considered as "other". The mean of *education* was 2.57, which tells us that the average participant was close to 3, meaning university grade education. Because the value 4 was such a high value, but does not represent any formal education, this specific value makes calculating the mean relatively complicated because 4, meaning "other", increases the mean of level of education, but the value itself does not represent a high level of education. The standard deviation of *education* was 0.65.

Income was also dummy coded. Before the dummy coding process, *income* had five separate values. In the dummy coding, the values 1, 2 and 3 are defined as "low income", while value 4 and 5 are defined as "high income". The mean of *income* is 2.64, meaning that the average is approximately around the middle mark of the values. The standard deviation of income is 1.16, which means that income is the variable with the largest average spread amongst the sociodemographic and socioeconomic variables.

Table 2

*Descriptive statistics for democraphics and socioeconomic variables (*N *= 384)*

	Min.	Max.	M	S.D.
Age	18	98	44.58	19.69
Gender	0	1	0.43	0.50
Education	1	4	2.57	0.65
Income	1	5	2.64	1.16

3.2 The connection between X and Y

Through a hierarchical regression analysis this thesis has found multiple different correlations between the various independent variables, and the dependent variable public transport. The analysis ran in two blocks. One of them contained the sociodemographic and socioeconomic variables, in addition to walking time, as this was a subject of interest. The other block contained same variables, but in addition the components from PCA and the variables *environmental friendliness* and *protection from poor weather* was also added. The two variables mentioned outside of the PCA in the previous sentence, was also subjects of interest, although they did not cohere well enough to the components in the PCA. They were therefore included as separate variables from the other components.

Only three of the variables were significant in the regression analysis, and two of these were again deemed significant in both blocks. A variable that is deemed significant means that the variable is of value and importance to the result, meaning that the findings that are significant may be used in the results and discussion. Non-significant findings may not be used in order to explain correlations between the independent and the dependent variables. The significant variables are *age* and *income* in both blocks, and *environmental friendliness* in block 2. *Environmental friendliness* has a significance of $p < 0.001$ which means the variable is most definitely significant. In block 2 both *age* and *income* have a significance of $p < 0.01$ which means the significance is slightly weaker, but still most definitely significant. In block 1 *age* has a significance of $p < 0.5$ which means that the significance is relatively weak, but still counts as significant.

Standardized Beta (β) defines the strength of the correlation between the dependent and the independent variable. Beta values are always between 0 and 1, or between -1 and 0. The closer the number is to -1 or 1, the stronger the correlation is between the two given variables. Whether the value is positive or negative defines if the correlation is positive or negative. In block 1 there were two significant variables, *age* and *income*. In the first block, *income* was the biggest predictor by a very small margin, β = 0.15, $p < .01$. Even though income was the biggest predictor, the difference between the beta values were so small that they predict about equally effectively. *Age* har β = 0.14, $p < 0.1$. Gender, education, walking time, well-being, physical activity, social status and protection from poor weather were not significant, $p < .05$.

R square (R^2) is an indicator towards how many percentages the block can accurately predict of the probability of the dependant variable. Adjusted R square (R^2adj) is R squared adjusted

to the number of predictors in the given block, and how the predictors influence the block. In the first block R^2adj = 0.04. This means that the sociodemographic and socioeconomic variables, as well as the variable *walking time* predicts 4% of the probability for the usage of public transport. Adjusted R square for block 2 is R^2adj = 0.10. This means that the previously mentioned variables in combination with the PCA components alongside the variables *environmental friendliness* and *protection from poor weather*, have the ability to predict 10% of the probability for the usage of public transport as one's transport mode.

R square change (ΔR^2) for a block is the difference in R square from the previous block to the current block. R square change for block 1 will therefore be the same as R square for block 1. R square change for block 2 is the difference in R square from block 1 to block 2. R square change for block 2 is $\Delta R^2 = 0.08$. This means that the percentage changed by 8 from block 1 to block 2. R square wen from 5% to 13%, but after the adjustment the adjusted R square values were 4% for block 1 and 10% for block 2.

Table 3

Hierarchical regression analysis for predicting public transport use (N = 384)

Step	Independent variable	b	SEb	β	p	R^2adj	ΔR^2
Block 1					.000***	.04	.05
1	Gender	-.18	.24	-.04	.438		
2	Age	-.02	.01	-.14*	.012		
3	Income	-.79	.29	-.15**	.007		
4	Education	.05	.24	.01	.829		
5	Walking time	.00	.00	.00	.971		
Block 2					.000***	.10	.08
1	Gender	.03	.24	.01	.913		
2	Age	-.02	.01	-.19**	.002		
3	Income	-.79	.28	-.14**	.005		
4	Education	-.02	.24	-.01	.918		
5	Walking time	.00	.00	.03	.524		
6	Well being	.19	.13	.08	.158		
7	Practicality	-.19	.12	-.08	.108		
8	Physical activity	-.00	.13	-.00	.973		
9	Social status	-.07	.11	-.03	.544		
10	Environmental friendliness	.56	.12	.25***	.000		
11	Protection from poor weather	.03	.13	.01	.838		

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

DISCUSSION

4.1 Results of the hypotheses

Of the sociodemographic variables *age* and *income* had a correlation with choosing public transport. There were very few quality attributes that had a correlation to choosing public transport. Only *environmental friendliness* was significant. Since there were only three significant findings, most of the hypothesises will have no correlation.

Hypothesis 1a was regarding age. *Age* is significant $p < .05$ i block 1 and $p < .01$ i block 2. There is a negative correlation between age and the usage of public transport. This means that the higher the *age*, the lower the probability of using public transport, and higher probability with lower the age. Therefore, hypothesis 1a is confirmed based upon the analysis.

Hypothesis 1b was regarding *income*. *Income* is significant $p < .01$ in both blocks. There is a negative correlation between *income* and the usage of public transport. This means that the higher the *income*, the lower the probability of using public transport. Therefore, hypothesis 1b is confirmed based upon the analysis.

Hypothesis 1c is regarding *walking time*. *Walking time* is not significant $p > .05$. There is no correlation between *walking time* and the usage of public transport. Therefore, hypothesis 1c is not confirmed based upon the analysis.

Hypothesis 2a was regarding *environmental friendliness*. *Environmental friendliness* is significant $p < .001$. There is a positive correlation between *environmental friendliness* and the usage of public transport. This means that the more the participant values *environmental friendliness*, the higher the probability of using public transport. Therefore, hypothesis 2a is confirmed based upon the analysis.

Hypothesis 2b is regarding *security*. *Security* is part of the component *well-being*. *Well-being* is not significant $p > .05$. There is no correlation between *well-being* and the usage of public transport, and therefore no correlation between *security* and the usage of public transport. Therefore, hypothesis 2b is not confirmed based upon the analysis.

Hypothesis 2c is regarding *social status*. *Social status* is not significant $p > .05$. There is no correlation between *social status* and the usage of public transport. Therefore, hypothesis 2c is not confirmed based upon the analysis.

Hypothesis 2d is regarding *practicality*. *Practicality* is not significant $p > .05$. There is no correlation between *practicality* and the usage of public transport. Therefore, hypothesis 2d is not confirmed based upon the analysis.

Hypothesis 2e is regarding *comfort*. *Comfort* is part of the component *well-being*. *Well-being* is not significant $p > .05$. There is no correlation between *well-being* and the usage of public transport, and therefore no correlation between *comfort* and the usage of public transport. Therefore, hypothesis 2e is not confirmed based upon the analysis.

Hypothesis 2f is regarding *protection from poor weather*. *Protection from poor weather* is not significant p > .05. There is no correlation between *protection from poor weather* and the usage of public transport. Therefore, hypothesis 2f is not confirmed based upon the analysis.

4.2 Important findings

In the analysis there was found support for three of the hypotheses, and three of the independent variables showed a correlation with the dependent variable. The most important find in the analysis is the correlation between the usage of public transport and the importance of *environmental friendliness.* This is an independent variable that was expected to be significant, but it was unclear if the significant correlation to the dependent variable was going to be positive or negative. In previous research there were evidence for both events in two separate studies (Egset & Nordfjærn, 2019; Şimşekoğlu et al., 2015). The two studies did inherit two separate fundaments for comparison, since the other disposable option than public transport was active transport in one of the studies, and car usage in the other. One could therefore argue that public transport is still considered environmentally friendly, even though active transport is even more so. In the hypothesis *2a: People who value environmental friendliness are more likely to use public transport* there was an active choice in leaning on the support from the analysis and even though previous research was contradictive, the hypothesis was still able to predict the result, that was a positive correlation.

Age, income and *environmental friendliness* were three of the variables that had a correlation with the dependent variable in this analysis. In the analysis it became apparent that individuals of lower age, lower income or a strong focus on being environmentally friendly were the most likely to utilize public transport. Younger individuals are often more susceptible to influences. Social learning theory and conformity are two sociopsychological theories that revolve around social influence (Gilovich et al., 2018; Raaheim, 2019). Given the definitions of these phenomena that were provided earlier in the article, one could argue that these two theories could contribute to explaining the results, in regard to young individuals being likely to use public transport. For example, in a social group consisting of purely students, it might be shunned upon to own a car. In addition, these two theories might contribute to understanding why environmental friendliness is so important to many individuals, and why this correlates to the use of public transport. This is because it is not socially acceptable due to the social norms in some groups or environments. This could as previously mentioned be explained

through both conscious and unconscious cases of conformity (Gilovich et al., 2018; Raaheim, 2019).

There were multiple variables that were expected to be significant in the analysis. All of the hypothesises that were stated was based upon inspiration from prior research, meaning that some studies had found significant correlations in all of these variables. Especially social status, security and practicality were expected to be significant. One reason as to why so few variables turned out significant might be the structure of the questionnaire. Based upon prior research, it seems that most other researchers have limited their studies to very few modes of transportation, often only one or two. In this questionnaire there was a segment where the participants were to consider the possibility of which they were to use 14 modes of transport. Keeping all of these transport modes in the back of one's mind while attempting to consider what quality attributes one considers important might interfere with the normal train of thought. It is possible that some of the participants considered such variables as security far too generally to provide an accurate answer. This might have led to certain variables appearing to be of weaker significance, than they would have been if there had been fewer modes of transportation to keep track of. It might be that too many participants saw, security for instance, in a too general way when answering the questionnaire, and that this led to fewer significant findings in the data.

Two of the studies that were included as previous research found correlation between the importance of security and the usage of public transport (Nayum & Nordfjærn, 2021; Şimşekoğlu et al., 2015). There was therefore an expectation that there was going to be a correlation between these variables. No matter what this study found, what is interesting is that the two other studies found contradictive results. One states a positive correlation, and the other states a negative. As previously mentioned, there could be multiple reasons as to why this has happened, such as age, geographical placement, when the study took place and so on. The fact that this analysis found no correlation is in combination with these two studies very intriguing. The study from 2013 found a positive correlation (Şimşekoğlu et al., 2015), the one from 2018 found a negative correlation (Nayum & Nordfjærn, 2021), and this current study found no correlation. One reason as to why this is the case could be an operationalization in the questionnaire. All three studies targeted security, and public transport. But all of these did not necessarily define these variables in the exact same manner. This could mean that the participants answered completely different questions, and that this is the reason of the contradictions. Another possible reason is when the studies were performed.

This current study was performed in February 2022, and it might be that general attitudes towards security and public transport have changed or evolved over the last 4 years since the previous study in 2018.

4.3 Strengths and limitations

This study has multiple aspects that strengthens the thesis, and actualizing the results of it. One of which is its broad selection of participants when it comes to sociodemographic and socioeconomic groups such as age span. The age span of the participants in this study is from 18 to 98 years of age. The study therefore represents individuals that are currently in almost all parts of a human life. This gives the study a broad insight into various attitudes and lifestyles. The study also finds strength in its participants that met the researchers in person. These participants were able to interact with the researchers, as well as ask any follow-up questions that might appear in correlation to the questionnaire, meaning that they might be able to deliver their answers in a more correct manner.

This study might also have had multiple limitations in regards validity and researching what the questionnaire is specifically trying to make research towards. The selection might be the first limitation. The selection excluded all individuals that did not agree to sharing all data, participants under the age of 18, and all participants that stated another gender than female or male. This did not exclude a vast number of possible participants, but it is still worth noting since it did lessen the selection. In addition, the field survey for this study took place during only one week of February, and in two malls in Trondheim. Whether or not this is a sufficient amount of time or locations to complete the field survey in is debateable. The total selection ended at 384 participants.

Another previously mentioned possible limitation might be a too general thought process regarding quality attributes. Since the participants were introduced to 14 different modes of transportation this might be stuck in the back of their minds during the next part of the questionnaire. Therefore, one might focus more upon what is important for choosing a mode of transport in general, rather than what quality attributes is important to that individual specifically when specifically considering one mode of transport. The questionnaire was in some ways forced to have this relatively impractical form, since it is meant to cover many different bachelor theses, but this does inevitably distance this questionnaire from previous

studies that focused on one or two modes of transport (Egset & Nordfjærn, 2019; Nayum & Nordfjærn, 2021; Şimşekoğlu et al., 2015).

When collecting the data, many participants asked for help to read the questionnaire out loud, or help to press a given button on the screen. This might lead to more dishonest answers, for instance in regard to estimated yearly income, if the individual did not trust that they would not be judged negatively by the researchers based upon their answers. This led to the questionnaire not being as anonymous as intended, on the participants request. This might affect the ecological validity of the questionnaire, as well as it might expose the participants and the data to a more extensive influence of social desirability by giving the answer the participants believe the researchers want, rather than the answer the participants truly wanted to give. This might also be explained by conformity, and the fear of standing out in a social group.

4.4 Implications for real life situations and later research

In this study, there was findings that supported a correlation between the dependent variable, use of public transport, and the independent variables, age, income and environmental friendliness. The findings point to how younger individuals, individuals of lower income, and individuals that value environmental friendliness have more frequent usage of public transport than older individuals, individuals with high income or individuals who do not value environmental friendliness. In order to influence society so that more individuals use public transport more frequently, this study supports the idea that one should focus on the findings of the correlation between these stated independent variables and the dependent variable that is usage of public transport. Environmental friendliness was in this study the most important factor, and the variable with the highest correlation, meaning an emphasis on promoting this aspect of public transport might lead to a positive effect on the usage. Given the results that this is the only quality attribute that had a correlation with the dependent variable, promoting this variable should according to this study positively affect the appeal of public transport.

CONCLUSION

What are the roles of social demographic variables when choosing public transport as transportation mode? And what are the roles of quality attributes in this choice? This study has used a self-administered anonymous questionnaire and the data it has provided in order to run a hierarchical regression analysis. The regression analysis showed a negative correlation between the usage of public transport and the two independent variables called *age* and *income*. This means that the probability of using public transport sank as the age or income rose. In addition, the regression analysis showed a positive correlation between *environmental friendliness* and the usage of public transport. This means that the more an individual valued *environmental friendliness,* the greater were the odds for using public transport. The environmentally friendly sides of public transport is something that with high probability would be beneficial to promote in order to accomplish higher usage of public transport. Later research might want to investigate what aspects that might encourage individuals that do not normally use public transport, to increase the frequency of how often they choose to do so, so that this environmentally friendly and sustainable transport mode may continue to spread and be wanted by the public.

REFERENCES

Egset, K. S., & Nordfjærn, T. (2019). The role of transport priorities, transport attitudes and

    situational factors for sustainable transport mode use in wintertime. *Transportation*

    Research Part F: Traffic Psychology and Behaviour, *62*, 473–482.

    https://doi.org/10.1016/j.trf.2019.02.003

Gilovich, T., Keltner, D., Chen, S., & Nisbett, R. E. (2018). *Social psychology* (5th ed.). W. W. Norton &

    Company.

Nayum, A., & Nordfjærn, T. (2021). Predictors of public transport use among university students

    during the winter: A MIMIC modelling approach. *Travel Behaviour and Society*, *22*, 236–243.

    https://doi.org/10.1016/j.tbs.2020.10.005

Raaheim, A. (2019). *Sosialpsykologi* (2nd ed.). Fagbokforlaget.

Rothe, J. S. (2022, March 24). *Flere reiser kollektivt igjen*. SSB. https://www.ssb.no/transport-og-

    reiseliv/landtransport/statistikk/kollektivtransport/artikler/flere-reiser-kollektivt-igjen

Şimşekoğlu, Ö., Nordfjærn, T., & Rundmo, T. (2015). The role of attitudes, transport priorities, and car

    use habit for travel mode use and intentions to use public transportation in an urban

    Norwegian public. *Transport Policy*, *42*, 113–120.

    https://doi.org/10.1016/j.tranpol.2015.05.019

Solerød, H., & Tønnessen, M. (2022). Demografi. In *Store norske leksikon*. http://snl.no/demografi