

**Active Travel Behavior: Demographic and Sociopsychological Predictors for Choosing
Walking as Transport Mode in Norway**

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Preface

This study is based upon empirical research, planned and executed in cooperation between students, student assistants and supervisor. The study focuses on sociopsychological predictors of transport mode use. I participated in this study with my fellow students in the subject BA11 “socio-psychological predictors of transport mode use”, collecting participants for the survey in Trondheim.

I would like to take this opportunity to thank my fellow students for a productive week gathering participants for the survey, and my supervisor for facilitating the study and streaming workshops online. In addition I would like to thank the student assistant for answering the million questions sent by me and my fellow students. On that note, I declare this work to be my own

Abstract

Walking is a form of physical activity that positively benefits both physical and mental health. This study investigates the roles of the sociodemographic factors age, gender and education on choosing walking as a transport mode. In addition, this thesis inspects the relationship between the psychological factors social norm, attitude, health and appearance in regards to walking as transport. It was predicted that a young age, high education and women would be most likely to choose walking for transport. Furthermore, it was predicted that participants scoring high on the travel needs physical activity and self-image, in addition to high scores on social norm and attitude were more likely to use walking as a transport mode. Results showed that some of the predictions was accurate, while others were not. Young age, high score on the travel attribute health, social norm and attitudes were significant predictors for choosing to walk. Higher education, women and a high score on appearance was however not significant predictors of walking for transport.

Introduction

In today's worldwide society the level of physical activity is declining and a sedentary lifestyle with obesity is increasing. Meanwhile the planet is also facing an environmental crisis and leaders are hoping to reduce pollution and slow down global warming. On this background it could be useful to look at walking as a positive contributor to both problems. Walking is a part of the term active travel, which usually refers to both walking and cycling, and combines an environmentally friendly transport option, in addition to a positive impact on the population's overall physical activity. It is important researchers study this topic so that the government and general public can get a clearer insight into what might predict walking for transport. This could provide us with a base knowledge on travel behavior, which could be used to try to influence more people to walk for transport. In doing so the society would contribute to a lesser impact on the environment, and at the same time increase overall physical activity levels and health. To understand what contributes to walking it can be relevant to look at psychological and environmental factors. On this basis, the goal of the study is to examine psychosocial and socio-demographic predictors' role in using active travel (walking). The psychological concepts included in this thesis are social norm, attitudes, and the quality attributes self-image and physical activity. For the socio-demographic factors age, gender and education were chosen.

This study is a new addition to the research on travel behavior in Norway. Much of the previous pool of study has been performed in other countries and does not necessarily apply to the Norwegian population. Exploring self-image and physical activity as predictors for walking in Norway can contribute with new knowledge on predictors with not much previous research. This study also investigates several predictors of walking making a diverse contribution to understanding Norwegian travel behavior. This study might also hopefully interest and spark more research on the topic, expanding an important research area for the creation of an environmental friendlier and healthier society.

Clough & Casey (2011) shares that theory of planned behavior is a theory that seeks to predict and explain human behavior. It says that intentions are the immediate contributor to behavior, meaning that a strong intention makes it more likely that a given behavior will be performed. In

this sense, intentions are the motivation to execute a behavior, in other words how willing are the person to perform it (Ajzen, 1991). Willing or not, the behavior has to be something the individual can decide out of will to do. intentions are in turn affected by attitude toward the behavior, subjective norm and perceived behavioral control (Ajzen, 1991). Still, he notes that an individuals' actual control over a behavior, for example having the time and resources to do it, plays a part in if the behavior is executed. If a person then has both the resources and intention to perform a behavior, then he should also be successful in doing it (Ajzen, 1991). Clough & Casey (2011) explains that attitude stands for how positively or negatively a person regards the behavior in question. Meanwhile subjective norm is how the person perceives social pressure to either do a certain behavior or not do it (Ajzen, 1991). The third contributor to intentions is perceived behavioral control and is how easy or difficult the person thinks performing the behavior will be. This aspect not only affects intentions but also directly affects performance of the behavior (Ajzen, 1991). For example, will a person who strongly believes he can execute the behavior with ease, will be more likely to perform the behavior and keep performing it.

If we transfer this theory over to transport mode choice we would think that attitude, subjective norm and perceived behavioral control will affect intentions to walk for transport, which in turn affects if the individual chooses walking for transport. (Ajzen, 1991) says for example that behaviors under a person's control can be predicted from the intentions regarding it with a good accuracy. An example of this is the behavior of choosing between available options. Then, if an individual's intention to walk is measured some time in advance and is found to be high, then they should also most likely choose walking for transport. The perceived behavioral control for walking may be relevant for walking and affected by for example physical health, where a person with a condition making it painful to walk may be less likely to walk even though they have an intention to do so.

How important the three aspects are for predicting intention, is something that varies across situations and with the given behavior (Ajzen, 1991). For example, attitude could play the biggest role in one scenario, a smaller in another and likewise for the other two contributors. From this it can be thought that attitudes play a role in walking for transport, although this study did not investigate subjective norms and perceived behavioral control toward walking. Meaning

that the theory of planned behavioral gives a pointer but cannot be confirmed when it comes to walking for transport.

Cialdini & Goldstein (2004) writes that humans are at heart driven to build and maintain meaningful social relationships with others. Therefore, we seek to perform behaviors that are approved by others, so that we ourselves also get approved. Conformity is a relevant term here relating to social behavior to suit a group defined by Cialdini & Goldstein (2004) as altering ones own behavior to fit with the responses of others. They also write that social norms are used to respond to social situations especially when the individual is in a situation where it feels uncertain (Cialdini & Goldstein ,2004). Furthermore, these social norms have been shown to influence many different types of behaviors, from recycling and littering to evading tax (Cialdini & Goldstein ,2004). On the other hand, the influence of social norms on behavior comes down to if the norm is focal or not, and if the norms are in alignment (Cialdini & Goldstein ,2004). This means that only when a social norm is in focus, can it impact behavior. A social norm being in focus signifies that it is highlighted prominently in the conscious mind (Cialdini & Goldstein ,2004). This suggests that social norm does not affect behavior unless it's information is brought out consciously. According to this it is relevant to think that social norm does not have to affect the decision to walk for transport, but could if the situation allows for it.

There have been a significant amount of research investigating active travel and its predictors and correlators. A large body of research have for example examined environmental correlates of active travel. Panter et al. (2011) is one of those studies, which have found that the strongest predictor for active commuting was the distance the individuals had to travel. A different study on environmental perceptions showed walkability of the neighborhood to be a significant predictor of active travel (Panter et al., 2009). Another study noted that previous literature has reported density and design to have showed up as of the most influential (Dalton et al., 2011). A significant amount of research has also investigated children and adolescents active travel predictors with less literature on older adults active travel behavior. Dalton et al. (2011) for example showed a connection between adolescent walking frequency and the different seasons, stating that individuals walked significantly more in the spring than in the winter. Moreover, those living in dense neighborhoods with sidewalks were the ones most probable to choose active

travel to school (Dalton et al., 2011). This is in line with other previous research that have found crosswalks and street connectedness as significant predictors for active travel among children.

Psychological factors

Another well examined area, are the psychological correlates of active travel. In this field Panter et al. (2011) researched older adults' active commuting and found that 25% of the participants used active commuting. They noted that having a strong habit for walking or cycling, made them more likely to choose walking for transport (Panter et al., 2011). A different study (Neto et al., 2020) looked at theory of planned behavior related to walking and found that attitude and perceived behavioral control were the most influential on walking, meanwhile subjective norm did not have a strong contribution. In this way attitude was indirectly connected to walking for transport. They therefore hypothesized that increasing the attitude toward walking could heighten the intention to walk and thereby also walking itself (Neto et al., 2020). Molina-García et al. (2010) investigated active commuting to university and discovered among else that physical self-efficacy and perceived planning were significant correlates of active commuting to university. In addition research has been performed examining parents' mode choice for their children, and Mehdizadeh et al. (2018) observed that psychological and socio-economic factors were significant factors for parents choosing a transport mode on behalf of their children. They also argued that personal norms about the environment made them more likely to let their children walk to school. In addition, they discovered that worry was connected to active commuting.

Health

Many previous research articles have looked at the connection between physical activity and walking for transport. Physical activity is defined by World health organization as all activity (WHO, u.å.). Though this has usually been to establish if and how active travel contributes to overall physical activity. Slightly less attention has been given to physical activity as a predictor for active travel. Sahlqvist et al. (2012) for example looked at how active travel contributed to recreational and total physical activity in the adult population, finding that active travel did not have an effect on the level of recreational physical activity, but did have a strong connection with

total physical activity. This research therefore suggested that the total physical activity was significantly connected to more active travel.

Singleton (2019) on the other hand looked at both sides of the relationship between physical activity and active travel. It stated that transportation was undeniably linked to physical health, and that active travel scored much higher on physical and mental health constructs. They also wrote that those who valued physical activity during transport were the ones who walked as opposed to other travel mode users (Singleton, 2019).

Appearance

It is to my knowledge scarce with research directly exploring the connection between self-image and walking for transport. Some research has on the other hand linked self-image and physical activity. Kirkcaldy (2002) for example found basis for a relationship where regular endurance exercise was related to a better self-image in German adolescents.

Social norm

Existing literature contained a moderate amount of research examining social factors and walking for transport. When it comes to social norm, the outcomes from these studies vary, some have observed a connection between social norm and active travel, while others have not. Accordingly, Yang (2019) relays that there should be a significant connection between social norm and active travel to school for children. Likewise Ball et al. (2010) also found that social norm was a significant predictor for physical activity. On the other hand Ortiz-Sanchez (2022) investigated the cognitive and environmental factors for active commuting to work and school, and discovered that social norm had no effect on the individual to choose active travel. Therefore they concluded that friends, family and acquaintances did not play a role in choosing active travel (Ortiz-Sanchez, 2022). Verhoeven et al., (2016) found in their research that those that perceived higher social modelling toward walking, also walked to school more. Meaning that if significant others walked the individual would be more likely to also walk. They did however note that the people proving most important for transport behaviour was siblings and friends of the individual (Verhoeven et al., 2016). This suggests an effect of the near social circle's travel behavior on the individuals mode choice.

Attitude

Reviewing the previous research, there is a large body of research readily available on the connection between attitude and walking for transport. Attitudes can be defined as a set of beliefs behavior and emotions about something or someone (Cherry, 2021). To my knowledge the findings consistently rapport a relationship between active travel and attitude. Beirão & Sarsfield (2007) backed this up and stated that attitudes towards transport were essential determinants for transport mode choice. Other research results showed that attitudes in favor of walking were connected to more walking for transport (Siiba, 2021., Yu & Zhu, 2016., Clark et al., 2016). Tran (2020) also discovered that a positive attitude towards general physical activity encouraged more walking. Another interesting literature finding was De Vos et al. (2018) who suggested a cyclical effect of attitudes and transport. The article proposed that individuals for example evaluated the walking trip as positive, which in turn affected their attitude toward it, and that further positively affected choosing walking for transport (De Vos et al., 2018).

On a slightly different note, De Vos et al. (2018) suggested that choosing to walk is connected to travel utility, where you selected the option of most utility (if the option had a good combination between travel time and costs for example). De Vos et al. (2018) non the less wrote that people with a positive attitude towards walking and who liked living in walkable areas tended to walk more than others. In addition De Vos (2018) Relays that positive reinforcement from a good walking trip may impact the attitude toward the mode and increase its use, making it a habit.

Demographic factors

There are frequently performed studies on demographic factors. Panter et al. (2011) shows research saying those living between 4-10km from their workplace were less likely to choose active commuting. In addition, men who lived in rural locations were less likely to walk for transport (Panter et al., 2011). Furthermore, they found that there was no difference between the genders on the probability for choosing active travel for those living close to work with strong habit scores (Panter et al., 2011).

Age

Most studies when reviewing the literature includes age in their active travel research. Here there is a wide range of studies finding age to have a significant relation to walking for transport (Clark & Scott, 2013). The majority of this literature finds age to have a negative association, where younger individuals walk more than older (Brainard et al., 2019., Song et al., 2013., Clark & Scott, 2013). Ferrari et al. (2019) On the other hand found evidence for older individual walking more than younger, with spending more time in this mode choice. Here they observed that individuals specifically above the age of 60 walked more.

Gender

Previous findings do not offer a clear view on the connection between walking for transport and gender. There are both results proving a connection between the two, with women walking more than men (Ferrari et al., 2019., Brainard & Cook, 2019). However there have been several studies finding that men used active travel to a higher extent than women (Singleton, 2019., Clark & Scott, 2013). Yet some studies had shown no connection at all for active travel (Panter et al., 2011), and have found that there was no difference between the genders on the probability for choosing active travel for those living close to work with strong habit scores.

Education

Literature on education and walking for transport suggests a significant relationship between walking and the level of education. Here the reported findings proposes that individuals with a higher education choose walking for transport to a bigger degree than people with a lower educational background (Burbidge & Gourlias, 2009., Neto et al., 2020). According to Clark & Scott (2013) this is the general consensus of the previous literature, however there are some studies that deviate from this, and shows evidence of lower education connecting to higher level of walking. One of these are Yu & Zhu (2016) finding that high parental education was related to not allowing their children to walk to school.

This study is a new addition to the research on travel behavior in Norway. Much of the previous pool of study has been performed in other countries and does not necessarily apply to the Norwegian population. Exploring self-image and physical activity as predictors for walking in Norway can enrich with new knowledge on predictors with not much previous research. This

study also investigates several predictors of walking making a diverse contribution to understanding Norwegian travel behavior. This study might also interest and contribute to more research on the topic, expanding an important research area for the creation of an environmental friendlier and healthier society.

Current study: research questions and hypothesis

On this background I have chosen two research questions, one being «*What connection is there between psychological factors and use of walking as transport mode?*». Furthermore, there is linked four hypotheses to this research question:

H1: Those with friends who walk for transport and are positive toward it, walk more than others.

H2: People with a positive attitude toward walking for transport, walk more than others.

H3: Those that view self-image as important use walking for transport more than others.

H4: People that view physical activity as important for choosing transport, walk more than others.

The second research question regards the sociodemographic factors, and states “*what connection is there between age, gender, education and the use of walking for transport*”. To this question I coupled three hypotheses:

H5: Younger citizens walk more for transport than older citizens.

H6: Women use walking as transport mode more than men

H7: Those with a higher education, walk more than individuals with other educational backgrounds.

Methods

Sample

A total of 395 people from the general public answered the survey. Nine of the participants had to be excluded from the survey for being under 18 years old. The participants were chosen by a combination of convenience selection and snowball selection. Respondents for the study was primarily picked from those found on the shoppingcenters Torget and City Syd in Trondheim. Additionally, the survey was sent to family and acquaintances online. The respondents mostly lived in Trondheim, but some of them lived elsewhere, or were just on holiday there.

Out of the participants there were 56.2 % percent women, 43.3 % men, 0.3 % other and 0.3 % that didn't want to answer. The average age was 44,47 (SD 19.7) and age range 80 years.

Procedure

Respondents were recruited in two malls in Trondheim as well as through online links sent to acquaintances between 21. february to 28. february 2022. They were informed that the survey was completely anonymous and that the survey was a part of a bachelor thesis at NTNU. The respondents were presented with the survey as a study on transport use and thoughts surrounding it. The first two questions were on consenting to participate and to use the information they gave. The survey was an online survey that the respondents in the malls completed on iPads supplied by NTNU. The participants recruited as acquaintances got the survey through links on social media. After completing the survey the respondents handed the iPads back, and they were wiped off. Since the research was anonymous, there was no need for ethical approvals.

Measurement instruments

The instruments used in this study was the quality attributes inventory. This is also the instrument I have used in my study. The quality attributes instrument measures the travel needs of the responder. There was one main question to this inventory reading: How important are the following aspects of transport when you select a transport mode? It had 17 items, with answers ranging from 1-5 of how important these quality attributes were for their travel option. 1 being very unimportant and 5 being very important. The participants thereby had to rate importance of the attributes for selecting a transport mode. Examples of some of the attributes were self-image, physical activity and security. This instrument was constructed by our supervisor on basis of previous research. To my knowledge this exact instrument have not been used before. It is worth noting that I also combined the two social norm variables to one mean variable measuring social norm score. I did the same for the two attitude variables.

Statistical analysis

For the descriptive analysis I measured through SPSS means, standard deviations, min, max and intercorrelations for all the variables I used in this study, excluding gender from means and SD. Frequency was also measured for the socio-demographic factors age, gender and education. The

connection between, age, gender, education, self-image, physical activity and the variables for social norm and attitude were investigated through testing for correlations. A principal component analysis was done on the quality attributes of travel instrument to make reduce and better the components. Since the research question asked how the independent variables connect to the dependent variable, I performed a hierarchical regression analysis on the independent variables to predict the dependent variable. In the hierarchical regression analysis, the independent variables were entered into the model in three blocks. This was done to find out if they could predict the dependent variable, and which of the independent variables was the strongest predictor, in addition to knowledge regarding if entering some variables made the model better at predicting the dependent variable.

Analysis also included a check for multicollinearity, through VIF, Tolerance and looking at the correlation matrix. Durbin-watson was also checked. All these checks turned out to be satisfactory, and the other assumptions for performing the regression analysis was met.

Results

Descriptive statistics

Table 1

<i>Means, standard deviations and intercorrelations (N=384)</i>										
measure	<i>M</i>	<i>SD</i>	1.	2.	3.	4.	5.	6.	7.	8.
1. Gender	-	-	-							
2. Age	44.5	19.7	.05	-						
3. Education	2.63	0.65	-.06	.17**	-					
4. Physical activity	3.40	1.08	-.07	.35**	.09	-				
5. Self-image	2.31	1.19	-.07	-.12*	-.11*	.03	-			
6. Social norm	3.06	1.00	.10*	.12*	.03	.15**	.00	-		
7. Attitude	4.40	0.77	.00	.19**	.13**	.35**	-.14**	.27**	-	
8. Walking	6.08	2.21	-.06	-.06	.03	.26**	-.06	.19**	.29**	-

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

Walking had a mean of 6.08 ($SD= 2.21$). The average age of the selection was 44.5 years. One hundred and forty two individuals were 18-30 years old, 90 participants were 31-50, 108 individuals were 51-70 years old and 46 were 71- 100 years old. There were 223 individuals with a university education, and 163 participants with other school backgrounds. One hundred and sixty-seven of the participants were male and 217 were female. There were initially two more categories, “other” and “do not wish to answer”, which were deleted to recode the variable into containing two categories. Doing this meant losing two participants in the analysis?????. Education held initially four categories and was recoded into two categories to fit the regression model.

Table 2

Summation of explorative PCA analysis of the general public (N=384)

	Factor 1	Factor 2	Factor 3	Factor 4	Communalities
Flexibility	.73	.08	.09	-.17	.53
Travelspeed	.73	.04	.16	.19	.57
Convenience	.73	-.11	-.02	.05	.54
Accessibility	.66	-.04	-.14	.04	.49
Reliability	.54	.05	-.42	-.09	.57
Fitness	.00	.94	.04	.03	.88
Physical activity	-.03	.93	-.01	-.01	.87
Safety	-.10	-.01	-.88	.01	.75
Security	.10	.05	-.85	.04	.80
Self-image	.02	-.06	.15	.85	.73
Novelty	.02	.14	-.28	.66	.60
Eigenvalue	2.95	1.91	1.32	1.14	
% of variance	27	17	12	10	
Total variance				66	
Cronbachs α	.73	.86	.78	.38	

Note. Factorloadings higher than 0.4 are shown in bold letters. The extraction method used was principal component analysis; rotated with oblimin with Kaiser Normalization.

A correlation analysis on the initial components was performed to determine rotation method, and a correlation between the factors was found. A principle component analysis with direct oblimin rotation was therefore run on the 17 variables. Total KMO was over the acceptable boundry at .60, KMO= .72, and Bartlett's test was significant, $p < .001$. On this background, I performed an explorative analysis to look at the potential factors. Kaisers criteria at 1 suggested that 5 components with a score above 1 should be retained. A visual inspection of the scree plot indicated no apparent bendingpoint, and that it might be best to retain 2 or 7 variables. Since there was initially 17 variables and Kaisers criteria suggested 5, I initially retained 5 factors. The variables environmental friendliness, costs, protection from bad weather, stress, travel time and comfort however were removed for loading heavy on more than one factor, or not logically fitting together as good components. After this reduction I therefore found 4 new components through a PCA. Total KMO for this analysis was above the acceptable boundry at .60, KMO= .68, and Bartlett's test was significant, $p < .001$. These new components explained together 66% of the variance. The 11 variables suggested that factor 1 stood for "travel attributes" and was the factor with the highest combined loading, Eigenvalue = 2.95, and it also has the highest variance (27%). Five variables loaded highest on this factor, $\alpha = .73$ (see table 2). Factor 2 represented "health", Eigenvalue = 1.91, and had the second highest variance (17%), with two variables loading highest on this factor, $\alpha = .86$. "Safety & security" represented the third factor, Eigenvalue = 1.32, and had the third highest variance (12%). Two variables loaded highest here, $\alpha = .78$. The fourth factor represented "appearance", Eigenvalue = 1.14, and had the lowest variance (10%), with two variables loading highest on this factor, $\alpha = .38$. Cronbach's α is below the desired level of .60 on factor 4, but since there is only two components behind it, cronbachs alfa is said to have limited usage for two item-scales (source). The reliability test cronbachs α shows that the new components, especially the three first, have a good reliability and measure what it is meant to measure.

The connection between psychological factors, sociodemografic factors and walking for transport

Table 3

Hierarcical regression analysis to predict walking as transport (N= 384)

Variables	<i>B</i>	SEB	β	<i>Adjusted R</i> ²	ΔR ²
Model 1				.00	.01
Age	-0.01	0.01	-0.06		
Gender	0.20	0.23	0.05		
Education	0.25	0.23	0.06		
Model 2				.09***	.09***
Age	-0.02	0.01	-0.18**		
Gender	0.10	0.22	0.02		
Education	0.09	0.22	0.02		
Health	0.70	0.12	0.32***		
Appearance	-0.23	0.11	-0.11*		
Model 3				.14***	.06***
Age	-0.02	0.01	-0.20***		
Gender	0.08	0.21	0.02		
Education	0.05	0.22	0.01		
Health	0.52	0.12	0.23***		
Appearance	-0.14	0.11	-0.06		
social norm	0.25	0.11	0.11*		
attitude	0.59	0.15	0.21***		

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

A hierarchical regression analysis was conducted to predict walking for transport among the general public. Model 1 contained the variables age, gender and education, and explained 0% of the variance in walking, and was found not significant, adjusted $R^2 = .00$, $F(3, 380) = 1.13$, $p = .339$. Model 2 added health and appearance, was significant and increased the models ability to explain variance for walking to 9%, $\Delta R^2 = .09$, $p < .001$, adjusted $R^2 = .09$, $F(5, 378) = 8.11$, $p < .001$. In model 3, social norm and attitude was added with a significant result and could explain 14 % of the variance, $\Delta R^2 = .06$, $p < .001$, adjusted $R^2 = .14$, $F(7, 376) = 9.86$, $p < .001$. In the second model health was the strongest predictor, $\beta = 0.32$, $p < .001$, and age the second strongest, $\beta = -0.18$, $p = .001$, followed by appearance $\beta = -0.11$, $p = .034$. In the third model the variable health was the strongest predictor, $\beta = 0.23$, $p < .001$, followed by attitude, $\beta = .21$, $p < .001$, and age, $\beta = -0.20$, $p < .001$, with social norm as the weakest predictor, $\beta = 0.11$, $p = .023$. In model 3

however, appearance was not a significant predictor for walking, $\beta = -0.06$, $p = .194$, neither was gender, $\beta = 0.02$, $p = .701$, and education, $\beta = .01$, $p = .831$.

Discussion

The results show that three of the psychological factors were significant predictors of walking for transport, while one was not. More results of this study also portray one of the demographic factors as a significant predictor of walking for transport, while the two others were not.

In this regression analysis there was significant support for the first hypothesis for social norm reading: “Those with friends who walk for transport and are positive toward it, walk more than others”. This shows that social norm was related to walking for transport with individuals scoring higher on social norm walking more often than those who did not. Previous research somewhat supports this finding (Yang et al., 2019), with studies connecting walking to social modelling (Verhoeven et al., 2016) and social norm to physical activity (Ball et al., 2010). This did suggest that the actions and attitudes of others (in similarity to social norm) could relate to active travel. The connection between social norm and physical activity also might indicate that there could be a predictive relationship with walking, seeing as walking is a form of physical activity. Conformity theory is another possible explanation for this finding, suggesting that social norm might be a significant predictor for walking because those close to them do so, and encourage it. Although there was also findings shutting down a relationship between social norm and walking (Ortiz-Sánchez et al., 2022), meaning that there was a also a possibility of the variable not being significant, which might be reflected in the poor strength of the predictor in this study.

The regression analysis also showed attitude to be a significant predictor, backing up the hypothesis that stated: people who think walking is beneficial to them walk more than others. This supports the belief that a positive attitude towards walking is linked to more walking for transport. Previous findings was in complete agreement with this result (Siiba, 2021., Yu & Zhu, 2016, Clark et al., 2016., Tran et al., 2020), something that may be visible additionally in the strength of the attitude predictor being the strongest in the model for walking. The reason for this finding may be somewhat explained by the cyclical relationship between experiences while walking for transport and attitude. Perhaps the people of Trondheim usually experience their

active travel as pleasant which affects attitudes toward walking, who in its turn affects walking for transport. There is also a possibility that theory of planned behavior could help explain this finding, although this study only measured attitude and did not stick to this theory when making the questionnaire. Therefore, attitude could be affecting intentions to walk which again affects the choice to walk, but this study cannot confirm that.

There was on the other hand no support found in the regression analysis on the third hypothesis reading: Those that view self-image as important use walking for transport more than others. The new variable appearance containing self-image was not a significant predictor and thereby those that viewed it important did not seem to choose walking more than others. On appearance there was also little previous knowledge connected to active travel, to back up this finding or to question it. A research Kirkcaldy (2002) found a connection to physical activity, so there was a possibility for significant findings. But it stated that physical activity was connected to a higher self-image.

The fourth hypothesis saying that: “People that view physical activity as important for choosing transport, walk more than others” was however found support for and can be concluded with as those that view physical health (health) do walk more than those who do not. Consistent findings in previous literature backs up these results (Sahlqvist et al., 2012). although most research looks at how active travel contributes to physical activity.

In the regression analysis the fifth hypothesis was also found to be supported. It tells you that: younger citizens walk more for transport than older citizens. This was found to be correct, with a negative correlation. The higher age was therefor found together with choosing less walking for transport and the younger the participant stated to be, the more walking for transport they reported. This is in line with most previous research finding that younger participants perform more active travel than older individuals (Brainard et al., 2019., Song et al., 2013., Clark & Scott, 2013). The reason age came up a significant predictor in this study and the previous, might be because older citizens struggle with health or mobility challenges (Clark & Scott, 2013). It is also possible that a higher age is found together with a different economic situation, where the individual has the personal economy to own and operate a car, whilst a younger individual might

be studying and living on a low salary. A younger participant may also be studying and choose to live near school campus, where they do not have the need for a car. It might also be because older individuals have access to taxi arrangements and are able to get to places in a more comfortable way.

There was on the contrary no support to the hypothesis of: “Women use walking as transport mode more than men”. Leading up to gender not being significant in predicting how much the individual would choose walking for transport. Being a woman would thereby not predict choosing to walk more than with men. This was somewhat an unexpected finding after reviewing the literature. From previous studies I suspected to find either men or women to be more inclined toward walking for transport. Ferrari et al. (2019) for example reported that women walked more than men, although another research found men walked more (Singleton, 2019). Even though the previous research was mixed, there still was a consistency in finding gender to be predictive of active travel. Those articles stating women walk more than men might be because women with children may walk their children places due to its suitability over cycling. Perhaps in the Norwegian sample the child care is more equally distributed contributing to more walking which shows an effect in these results.

The seventh hypothesis reading: “Those with a higher education, walk more than individuals with other educational backgrounds” did also not have any support from the regression analysis, and there are no grounds for saying that those with a higher education walk more than others. This was also a surprising finding based on previous research mostly portraying a higher education to be related to more walking for transport (Burbidge & Goulias, 2009., Neto et al., 2020., Clark & Scott, 2013). Previous research might have found these results because higher educational individuals may also read more, perhaps scientific articles relating to health or maybe they are more into being active and fit, and that is part of the reason for the previous literature results. This may be different in this study due to the research being mainly situated in the student city of Trondheim with many young people participating in the study. With the educational question the participant were answering how much education they had finished. It could be that since many of the participants likely was actively studying and had perhaps not finished their bachelor degree, they had to answer that they had finished lower education and was therefore pooled in the lower

level educational group. It is according to this relevant to think that students, like bachelor students do quite a bit of active travel, and therefore made an impact on the lower educational group, leading to higher education not being a significant predictor for walking.

Although there were significant findings, the strength of those findings were weak for both age, health and attitude, and very weak for social norm. In addition the whole model only accounted for 14 % of the variance involving walking. This suggests that there are possibly other legitimate factors that could be predicting walking for transport, that this regression model did not include.

One of the most important findings was therefore, that four of the variables turned out as significant predictors for walking yet was not able to precisely predict walking for transport, thereby as stated above suggested there might be other factors affecting if people choose to walk. One such variable could be weather, that is connected to the choice of active travel, seeing as Trondheim gets quite cold in the winter season. The time crunch, along with illness, economy and the road maintenance of the city might also be a possible unknown predictor of active travel, and with that also one of the reasons these seven predictors have a low predictive power.

It can also be a reflection of the fact that the model seeks to predict the human behavior of choosing walking for transport. According to Frost (u.å.) human behavior is difficult to predict, and therefore often has r-squared values of less than 50 %. Still the article mentions that a high R-value is necessary to make precise predictions Frost (u.å.). The low adjusted R² could mean that although several values turned up as significant predictors, the variables entered did not add much value to the model, meaning that although the findings were significant, the changes in them does not account for a large variance in the dependent variable. This could mean that the model does not fit as well as it should. On the other hand, seeing that adjusted R² did increase with adding variables, the variables add some value to the model, granted not a large amount.

Low precision in the prediction means that the observed values can be quite different from de prediction. A high precision would thereby mean the prediction was close to the actual observed value. On that note this model shows to be not particularly precise, and the observed values could be much further from the prediction than desired.

Strengths and limitations

Strengths of this study was the wide age range participating in the study, in addition to the total amount of participants, which supports representativeness. In addition the survey is quite easily used and did not cost anything to administer. It also portrays the effect of seven predictors on walking for transport. The survey is also able to make some modest predictions. The mix of convenience and snowball sampling had the strength of being able to gather many participants in a short amount of time, while also having readily accessible participants at the mall it was also able to reach participants that did not go to the mall. Another strength was the online questionnaire and its power to monitor which groups (like age and gender) of the public had answered the survey, which in turn made it possible to adapt the recruitment to the lacking groups.

There were also limitations, where the mix of the two sample methods negatively affects representativeness. There was also the fact that the survey was quite long, which contributed to some participants cancelling mid-survey, due to time limitations. The reliability of all the variables might also not be the best, noting that some participants had trouble understanding certain questions, leading different interpretations among participants. The regression model is also not able to infer any causal relationship. The precision of the predictions are not as high as generally desired. In addition, there is always a chance that people are not honest on self reporting surveys. av validerte/tidligere brukte instrumenter, operasjonalisering av begrep, reliabilitet.

Implications and further research

The findings in this study have implications for individuals working to promote an environmentally friendly and healthy city. From this study they may receive pointers in where to make changes to boost walking for transport. If they are able to increase walking for transport, they may also reduce the need for parking, better the environment and increase public health. Additionally, they could be successful in the reduction of traffic crashes and negative stress in the traffic (Shannon et al., 2006).

From this study it is possible to build on the findings that viewing health as important when selecting transport mode was a significant predictor to walking for transport. The non-significance of the less researched variable for appearance (self-image), suggests no predictive power on walking, but will need more research to confirm it. Future research should also choose different sampling if possible, favorably random sampling to achieve higher representativeness for the study.

Conclusion

This study found that younger individuals and those perceiving health as an important attribute when choosing travel mode, were more likely to choose walking for transport. Those with people around them who encourage them and who walk for transport, are more likely to use walking themselves. In addition, people with a positive attitude toward the benefits of walking and its suitability in the local area, were more likely to walk for transport. On the other hand older people, those not viewing health as important, individuals with acquaintances negative to walking and those having a negative attitude toward walking for transport, were less likely to choose walking as a transport mode.

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