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Relations between transport choices and active behaviour

Abstract

Unhealthy lifestyle choices and passive behaviour are a significant problem for many developed countries. They lead to a decrease in public health in the form of diseases related to contemporary civilization, such as: cardiovascular diseases, type II diabetes and obesity. This increases the costs generated in the healthcare system. The share of costs resulting from combating these diseases increases every year.

The choice of a transport mode used when commuting is often perceived as one of the factors leading to more proactive behaviour and thus decreasing the externalities not only connected directly with transport such as pollution, noise, congestion and accidents, but also those connected with public health.

The paper shows the results of a study performed in Poland, which was meant to identify and measure the relations between the transport choices and other proactive choices of commuters. A logistic regression model was estimated to identify the occurrence and intensity of these relations.

The goal of the article is, therefore, to assess whether the choice of a transport mode used when commuting is connected with other types of proactive behaviour of citizens. In particular, the author wishes to determine if people choosing a car as their mode of transport tend to be generally less active than people choosing public transport or those who commute actively.

Keywords: transport choices, public health, transport behaviour
JEL Classification Codes: C35, D12, R41

1. Introduction

Public health is one of the main factors of sustainable development of economies and societies. Transport is often perceived as one of the factors determining sustainability. This is due to the fact that the choice of the mode of transport results in the generation of various externalities, such as external costs of pollution, noise or accidents. However, it is worth noticing that transport is also connected with the externalities connected with public health. The very choice of a transport mode has an effect on an individual's state of health. It determines both the physical and the mental health condition of a person [Suchanek, 2018].

It is widely accepted that public health is determined by the physical environment, social environment, lifestyle and health behaviour, medical care and genetics [McGovern et al., 2014]. The relations between the physical environment and social environment and transport have been widely researched [among others: Lucas et al., 2001; Wilkinson et al., 2003; Giles-Corti, Donovan, 2002]. It is thus worth assessing whether the lifestyle and pro-health behaviour also determines the transport choices of commuters. Even though the current society is often described as a society in motion and a society which is very proactive [Lash, Urry, 2003], the modal decisions of commuters often prove otherwise because in most European countries, a personal car is still the transport mode of choice when it comes to commuting [Sierpiński, 2013]. This creates a plausible contradiction when analysed together with the rising levels of physical activity [Althoff et al., 2017]. This is certainly a problem worth researching.

The goal of the article is, therefore, to assess whether the choice of a transport mode used when commuting is connected with other types of proactive behaviour of citizens. In particular, the author wishes to determine if people choosing a car as their mode of transport tend to be generally less active than people choosing public transport or commute actively.

2. Proactive behaviour as a potential determinant of the transport mode choice

The fact that societies, especially in the developed countries, tend to show a low level of physical activity is an increasingly important problem [Ding et al., 2016]. Lower levels of physical activity generally result in a decline in public health, especially if the activity level is extremely low [Sallis et al., 2016]. This is why one of the overall tendencies, especially visible in the European Union policy framework, is to promote proactive behaviour, among others, through the choice of more active transport modes. The general assumption seems to be that the promotion of a healthy, active lifestyle should result in more sustainable transport behaviour, such as commuting with public transport or in an active way. However, it is not clear whether a more active lifestyle results in a more active transport behaviour. The studies' results seem to be inconclusive [Shaw et al., 2017].

In fact, the level of active behaviour, measured either as a form of self-perception or in an objective manner is rarely pinpointed as one of the determinants of the mode of transport choice. The choice of a mode of transport is a choice which is the consequence of the transport need, either an obligatory or facultative one and is, therefore, dependent on a plethora of factors [Wyszomirski, 2008]. The reasons for the choice of a particular transport mode are the consequence of the attributes of the transport means [Hebel, 2013]. Price, travel time and the overall quality are often said to be the main deciding factors, but the precise list of factors and their weight is different when it comes to individual transport, public transport and active commuting. When it comes to travelling by car, the main deciding factors are: convenience, short travel time, a lack of convenient public transport connections. For the public transport factors such as good public transport offer, lower costs and congestion are usually taken into account [Kłos-Adamkiewicz, 2017]. Other studies point out that the reasons behind the transport choice are far less rational and depend on psychological determinants including the psychological profile of a commuter in regard to the: needs for autonomy, needs for personal space and sense of identity [Wyszomirska-Góra, 2013]. Nevertheless, choosing public transport rarely seems to be the result of a generally proactive nature of a commuter.

3. Material and methods

The collected data consists of 243 observations collected from the residents of the Tricity Metropolitan Area in Northern Poland using the CAWI method. The collected data was used to create 26 variables, with scales varying from nominal to ratio. Three synthetic variables were created: Body Mass Index (BMI), Non-Specific Psychological Distress (NSPD), Main Commute Mode. The BMI variable was created by dividing the weight measured in kilograms by squared height measured in meters. The NSPD variable was created by summing up the six variables, which constituted the self-assessment of the mental health using Kessler's Non-Specific Psychological Distress Scale. They were as follows [Kessler et al., 2002]:

- how often do you feel sad?
- how often do you feel nervous?
- how often do you feel restless?
- how often do you feel hopeless?
- how often do you feel everything is an effort?
- how often do you feel worthless?

After the construction of the synthetic variable, an internal consistency and accuracy analysis was performed (Table 1).

The consistency analysis showed an overall value of the Alpha-Cronbach parameter equal to 0.87, which together with the analysis of the values in the table leads to an assumption that the variable was properly constructed.

Table 1. Consistency analysis for the NSPD variable

	Mean when removed	Value when removed	Alpha when removed
How often do you feel sad?	12.78601	17.11470	0.840350
How often do you feel nervous?	12.62963	18.89163	0.873402
How often do you feel restless?	12.98354	16.22195	0.840206
How often do you feel hopeless?	13.30864	15.52202	0.828306
How often do you feel everything is an effort?	13.02469	16.69075	0.854052
How often do you feel useless?	13.68313	16.26585	0.847931

Source: own study.

The last synthetic variable was the Main Commute Mode, which was constructed based on the respondents' answers to the question on what basis was their main transport mode chosen when commuting. They could declare that they used: a car, tram, bus, trolley, railway transport, bike or that they travelled on foot. Their answers were aggregated to three categories of the variable: car, public transport, active commute.

The relations between the main commute mode and all the nominal variables analysed are shown in Table 2.

Table 2. Contingency table – nominal variables and main commute mode

	Main Commute Mode – Car	Main Commute Mode – Public Transport	Main Commute Mode – Active Commute
How often do you consume alcohol?			
A few times a week	5	13	6
A few times a month	21	80	18
Once a month	10	27	7
Less than once a month	3	27	9
Not at all	5	11	1
Do you smoke?			
Yes	8	16	6
Rarely	8	30	7
No	28	112	28
How often do you do any sport?			
A few times a week	16	41	15
A few times a month	17	69	13
Once a month	5	11	6
Less than once a month	5	20	3
Not at all	1	17	4
Do you eat healthy?			
Not	1	4	2
Rather not	5	19	3
Moderately	11	32	10

	Main Commute Mode – Car	Main Commute Mode – Public Transport	Main Commute Mode – Active Commute
Rather yes	24	89	22
Yes	3	14	4
Are you active?			
Not	2	7	1
Rather not	4	32	7
Moderately	2	32	8
Rather yes	27	70	19
Yes	9	17	6
Area of residence			
Rural	3	20	6
Urban less than 10k	0	4	2
Urban 10–50k	4	18	8
Urban 50–100k	3	15	2
Urban above 100k	34	101	23
Marital status			
Single	16	55	26
Informal relationship	24	97	15
Married	4	6	0
Diabetes type II			
Yes	1	3	0
No	43	155	41
Hypertension			
Yes	1	3	2
No	43	155	39

Source: own study.

The variables which were taken into account were supposed to represent a wide variety of pro-active behaviour, as well as the physical and mental condition of a commuter [Tajalli, Hajbabaie, 2017, pp. 4–5).

Based on the collected data, three logistic regression models were generated. Their objective was to show which factors affect the choice of the transport mode when commuting. The logistic regression models all included the Main Commute Mode as the dependent variable and the outcomes were modelled in pairs: car/public transport, car/active commute and public transport/active commute.

4. Results

The first logistic regression model shows how the choice between the car and public transport is affected by various factors (Table 3).

Table 3. Logistic regression – commute mode – pair car/public transport

Effect	Level	Value	p
Const.		−3.0001	0.184388
How many sodas do you drink weekly?		0.0788	0.390823
Disposable income		0.0008	0.015644
No. of people in the household		0.2965	0.129012
How many fruit/vegetable portions a day do you eat?		−0.3020	0.253691
Commute time (minutes)		−0.0911	0.000092
NSPD		−0.0272	0.655285
BMI		0.0007	0.975289
Diabetes type II	Yes	−0.0160	0.983820
Gender	1	−0.2645	0.346257
Marital Status	Single	−0.2758	0.562934
Marital Status	Informal relationship	−0.7235	0.104105
Residence	Rural	3.1549	0.022714
Residence	Urban less than 10k	−14.7623	0.000000
Residence	Urban 10–50k	3.6263	0.002653
Residence	Urban 50–100k	3.7665	
Are you active?	No	−0.3364	0.720713
Are you active?	Rather not	−0.3936	0.564181
Are you active?	Moderately	−1.9773	0.020592
Are you active?	Rather yes	0.9558	0.049983
Do you eat healthy?	No	2.3968	0.069908
Do you eat healthy?	Rather not	−0.7457	0.308323
Do you eat healthy?	Moderately	0.6843	0.248104
Do you eat healthy?	Rather yes	−0.2563	0.615995
How often do you do any sport?	A few times a week	0.1067	0.854167
How often do you do any sport?	A few times a month	−0.4621	0.369489
How often do you do any sport?	Once a month	1.5739	0.060995
How often do you do any sport?	Less than once a month	0.5736	0.404382
Do you smoke?	Yes	0.8230	0.118411
Do you smoke?	Rarely	−0.3964	0.439106
How often do you consume alcohol?	A few times a week	−0.2610	0.716053
How often do you consume alcohol?	A few times a month	−0.0133	0.976945
How often do you consume alcohol?	Once a month	0.9948	0.085106
How often do you consume alcohol?	Less than once a month	−1.4537	0.114393
Hypertension	Yes	0.0066	0.993331
Scale		1.0000	

Source: own study.

The only variables which are the statistically significant predictors in this model are: disposable income, commute time, residence and the self-perception of being active. The

three first factors are objective and they have nothing to do with the pro-active behaviour of a commuter. What is interesting is that the choice is also affected by whether the commuter perceives himself or herself as being active, whereas it is not affected by any other pro-health behaviour indicators such as healthy eating, smoking, consuming alcohol or engaging in sporting activities. This might suggest that in this case the choice is not related to the pro-active behaviour itself but in fact to the sense of identity of the commuter who defines his or her pro-active behaviour through his/her transport choice.

The second logistic regression model shows how the choice between a car and active commute is affected by various factors (Table 4)

Table 4. Logistic regression – commute mode – pair car/active commute

Effect	Level	Value	p-value
Const.		−51.2299	0.012603
Disposable income		0.0018	0.181053
No. of people in the household		1.4185	0.145279
How many sodas do you drink weekly?		1.8994	0.013521
How many fruit/vegetable portions a day do you eat?		−0.0282	0.973505
Commute time (minutes)		0.1687	0.111502
NSPD		0.3778	0.061304
BMI		1.1315	0.021278
Gender	1	1.5665	0.171091
Marital Status	Single	−6.2423	0.003230
Marital Status	Informal relationship	−3.5823	
Residence	Rural	0.5528	0.961460
Residence	Urban less than 10k	−14.1006	0.667755
Residence	Urban 10–50k	−1.5937	0.891783
Residence	Urban 50–100k	7.9646	
Are you active?	No	9.7872	0.079213
Are you active?	Rather not	−3.1813	0.104439
Are you active?	Moderately	−10.1339	0.016204
Are you active?	Rather yes	−0.4728	0.706968
Do you eat healthy?	No	−5.4815	0.177575
Do you eat healthy?	Rather not	19.3169	0.023980
Do you eat healthy?	Moderately	−4.9116	0.107413
Do you eat healthy?	Rather yes	−2.9387	0.236735
How often do you do any sport?	A few times a week	1.0743	0.550345
How often do you do any sport?	A few times a month	1.1644	0.539695
How often do you do any sport?	Once a month	−0.2005	0.943574
How often do you do any sport?	Less than once a month	12.6606	0.018931
Do you smoke?	Yes	6.4590	0.024659
Do you smoke?	Rarely	−4.4988	0.039612

Effect	Level	Value	p-value
How often do you consume alcohol?	A few times a week	−6.7477	0.025302
How often do you consume alcohol?	A few times a month	2.7773	0.080869
How often do you consume alcohol?	Once a month	−1.7282	0.334512
How often do you consume alcohol?	Less than once a month	−15.9713	0.025982
Hypertension	Yes	−14.7368	0.021873
Diabetes type II	Yes	2.3457	
Scale		1.0000	

Source: own study.

In this case, the variables which proved to be statistically significant are: the number of fizzy drinks consumed per week (the car users on general drink more soda), BMI (an increase in BMI by one point increases the chance of using a car as the mode of transport by 1.13%), marital status, healthy diet (people who keep a healthy diet are less likely to choose a car as their mode of transport), being active (people perceiving themselves as being active are less likely to choose a car as their mode of transport), doing sport (people who engage in sporting activities less than once a month are 12% more likely to commute by car), smoking, consumption of alcohol (both the smokers and the drinkers are more likely to commute by car) and hypertension. This is a radically different set of significant variables than in the case of the first model. Whereas in the choice between a car and public transport objective factors played the key role, here it is in fact the proactive behaviour which matters. The choice between the active commute by bike or on foot and the commute by car is affected by the overall pro-health behaviour of a given commuter. What is worth noticing is that neither the commute time nor the disposable income are important factors when choosing between a car and the active commute.

The third logistic regression model shows how the choice between public transport and active commute is affected by various factors (Table 5).

Table 5. Logistic regression – commute mode – pair public transport/active commute

Effect	Level	Value	p-value
Const.		5.73724	0.038207
How many fruit/vegetable portions a day do you eat?		0.08828	0.739720
Disposable income		−0.00221	0.003268
No. of people in the household		−0.34330	0.152934
How many sodas do you drink weekly?		0.15140	0.431028
Commute time (minutes)		0.26638	0.000013
NSPD		0.12293	0.119792
BMI		−0.01925	0.433706
Gender	1	0.01902	0.966186
Marital Status	Single	−6.10928	0.000000

Effect	Level	Value	p-value
Marital Status	Informal relationship	−4.92535	
Residence	Rural	−1.54654	0.113054
Residence	Urban less than 10k	2.25253	0.127004
Residence	Urban 10–50k	0.30030	0.738752
Residence	Urban 50–100k	−0.53593	0.658753
Are you active?	No	−0.13718	0.919575
Are you active?	Rather not	1.32934	0.183898
Are you active?	Moderately	0.73294	0.367134
Are you active?	Rather yes	−1.01484	0.141617
Do you eat healthy?	No	−6.27227	0.002956
Do you eat healthy?	Rather not	2.13650	0.115396
Do you eat healthy?	Moderately	1.73839	0.046286
Do you eat healthy?	Rather yes	1.08280	0.164165
How often do you do any sport?	A few times a week	0.32198	0.684323
How often do you do any sport?	A few times a month	1.53336	0.029350
How often do you do any sport?	Once a month	−2.64127	0.020530
How often do you do any sport?	Less than once a month	−0.38368	0.723509
Do you smoke?	Yes	0.33772	0.647800
Do you smoke?	Rarely	−0.75394	0.342910
How often do you consume alcohol?	A few times a week	−0.81015	0.482787
How often do you consume alcohol?	A few times a month	0.26679	0.740455
How often do you consume alcohol?	Once a month	−0.06877	0.944565
How often do you consume alcohol?	Less than once a month	−1.40380	0.175828
Hypertension	Yes	−2.74876	0.094445
Diabetes type II	Yes	7.02157	
Scale		1.00000	

Source: own study.

In this case, the significant variables are: disposable income, commute time, marital status, healthy behaviour and engagement in sports activities. The results show that the choice of public transport is heavily affected by the objective variables, as was the case with the choice between a car and public transport. Still, some pro-health behaviour factors affect the choice. People who maintain a healthy diet and engage in sports activities are generally more prone to choose an active way of commuting. This is, however, outweighed by the significance of the commute time. The longer the commute time, the more likely commuters are to choose public transport over a bike or a commute on foot.

5. Summary

The results show that the factors which affect the transport choice of a commuter are heavily dependent on the choice which he/she makes. If the commuter chooses between a car and public transport or the active commute and public transport, his or her choice is bound to be heavily dependent on objective factors such as disposable income, residence area and, above others, the commute time. If, however, the choice is between a car and the active commute by bike or on foot, the commuter's choice is far more likely to be affected by his or her general proactive and pro-health behaviour. This is not a conclusion which is in line with promoting the public transport commute as a way of improving the physical activity of the population. In fact, public transport seems to be the mode of transport which is chosen by people due to objective factors and not as a lifestyle choice. If the members of the population who are objectively proactive can commute in an active way, they are likely to do so. If, however, this is out of the question due to an objective factor like the commute time, their choice between commuting by car and by public transport is likely to be determined by other objective factors, such as disposable income and not by their general proactive behaviour. This shows that despite the efforts, public transport is still not perceived as a proactive mode of commuting.

Therefore, if the goal of policymakers is to promote more proactive behaviour with the thought of increasing the level of public health in mind, they are more likely to succeed by promoting active commuting than public transport. Solutions such as bike-sharing systems seem to fit in that trend. One thing worth noting is that, even though the choice of public transport is not determined by objective proactive behaviour, it is in fact determined by the perception of being active. This suggests that a more intensive promotion of public transport as a proactive way of commuting might result in a different image of that mode of transport and in turn in a modal switch in that direction. However, it also shows that further study is necessary regarding the effect which psychological factors, including the personality profile, have on the transport behaviour of the population.

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