

## HUMAN HEALTH AND ROAD TRANSPORT

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**Abstract:** *A significant factor affecting adversely the environment and human health is transport. In this paper we deal with its environmental and then its health effects. Further, we present the results yielded by the descriptive part of the investigation focused on an analysis of pupils' attitudes towards individualised car transport. In the relational part the relation between "attitudes towards motoring" and "attitudes towards environment protection" is analysed. The urgency of the problems associated with transport and the results of the investigation confirm the necessity of integrating the given topic into the educational curriculum of all types of schools.*

**Key words:** *health, the environment, environmental education, health education, attitude towards motoring*

### Introduction

Within the research project we focus on the issues of environment-friendly lifestyle in the context of health promotion. We assume that the quality of the environment is an important health aspect and that the state of the environment is becoming its basic determinant and regulator. A significant factor adversely affecting the environment and human health is transport as an indispensable part of life in this society. It is apparent that the present society would be inconceivable without the constant transport of commodities, products and information.

In this study we are grounded on the selected conclusions of previous investigations (HORKÁ, HROMÁDKA 2008, p. 21–33; HORKÁ, HROMÁDKA 2009, p. 46), dealing with the problem of pupils' attitudes towards individualised car transport.

One of the questions in the questionnaire in our investigation (HORKÁ, HROMÁDKA 2008) was in the form of an open question: "What do you consider the greatest health threat in the city? (at least 3 examples). Following a qualitative analysis of the data these categories of "threats" arose (see diagram No.1): the most frequently mentioned category was "smog – polluted air" (51.3 %), the second most frequent was "cars" with 43 % (HORKÁ, HROMÁDKA 2008, p. 21–33). It should be noted that in a similar investigation carried out by students of the Faculty of Education Masaryk University the results of answers to an identical question were following: most frequent "smog – polluted air" (68.4 %) and the second most frequent was again the category "cars – transport" with 53.8 % (HORKÁ, HROMÁDKA 2009, p. 46).

Emissions (and particularly emissions produced by road transport) are under-

stood by respondents as the highest health threat to the life in a city. We have to ask, then, what is the attitude towards motoring, i.e. a phenomenon which is a cause of such a seriously perceived threat?

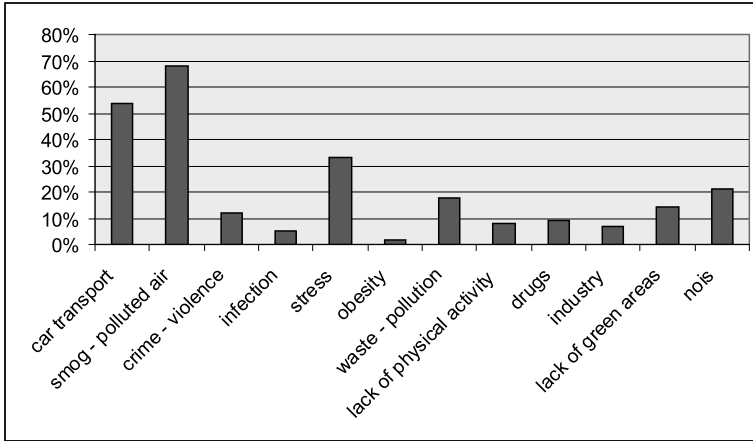


Diagram No.1 (N = 264) (HORKÁ, HRMÁDKA 2008)

The focus of our attention is motoring as a remarkable phenomenon, especially in social context. Its undoubtedly detrimental effect on the environment as well as human health should lead to its permanent and consistent social criticism, however, it seems there is very little of it (or the criticism is not as severe as the phenomenon probably deserves). As far as the official statistics of western countries are concerned, the area of transport has not been affected by the ecological movement, although in other areas the effort has been influential already since the 60's and 70's in the 20<sup>th</sup> century (KELLER 1998, p. 92). Environmental education and promotion are rightly focused on topics such as separation of waste, heat cladding of houses, shopping for “environmental-friendly products“ etc. Nevertheless, the demand for restriction of transport is still likely to be perceived by the society as inappropriate ecological radicalism or extremism, despite the fact that decrease of transport is a variable which can significantly influence ecological footprint.

The effect of passenger cars on the environment and human health is quite problematic compared to other forms of transport. Air transport obviously causes greater damage to the environment, but even this is relative. If we compare environmental damage of air travel and car transport by means of a (relatively reliable) interactive calculator Ecopassanger (<http://www.ecopassanger.org>), in most parameters (such as emissions of carbon dioxide and nitrogen oxide) air travel in average European loading reaches rather worse results than car travel (where the average load factor is 1.5 passenger). However, as far as human health and the threats for health are concerned, car transport is in this comparison much more harmful than air travel.

## The impact of road transport on human health

Transport is one of the most dynamic branches of human activity. It influences the life of humans significantly, and in many aspects. Firstly, it represents a risk of lethal

accidents, which is a striking characteristic of the most dangerous form of transport. Secondly, it poses a latent risk in a possibility of creating patterns of comfortable lifestyle reducing physical activity leading to obesity and civilisation diseases.

The health risk of cars obviously lies primarily in emissions. Some components of car exhausts:

- carbon monoxide (reduces the ability of blood to transport oxygen)
- unburned organic substances – acids, aldehydes and their derivatives (irritates mucous membranes of breathing apparatus, mucous membrane of eyes, can cause breathing problems),
- soot can contain polyaromatic hydrocarbons etc. (might be carcinogenic, mutagenous).

The danger of car emissions particularly lies in the fact that they are released right in the heart of human settlements, in the streets, squares and urban residences (cp. HORÁK 2000).

## **The impact of road transport on the environment**

Various overview reports imply (e.g. BENDL 2008, p. 17-23) that road transport plays the most important role and its adverse effect is seen primarily in the production of emissions polluting the air. A significant component of exhaust emissions is carbon dioxide, whose threat lies in the fact that it is a “greenhouse gas“. According to Houghton (1989) road transport is the greatest producer of carbon dioxide amongst other forms of transport. It is increasingly contributing to its increase in the atmosphere and thus is significantly changing one of the planetary components.

Transport also exploits non-renewable natural resources and given the unsustainable world growth of the population it is obvious that the oil reserves will be exhausted prematurely with all the negative economic and social consequences. According to Bendl it is necessary to “*brace ourselves for the oil turning point in advance*“.

Among other car exhausts there are nitrogen compounds. Alongside sulphur dioxide nitrogen compounds contribute to acid rains, which are the cause of acidification of soil. Photochemical smog (especially ground ozone), which also accompanies road transport, damages human health as well as vegetation. The contamination of soil, water and biota as a result of pollution from road transport and due to the application of road salt in winter also has negative effect. Apart from emissions the environment is adversely affected by the noise and vibrations from transport, especially in urban agglomerations.

Due to the development of transport the appearance and morphology of the countryside is changing too – the road networks are barriers for migrating wild animals. The requirements of transport restrict not only humans and plants and animal species, but also have a detrimental effect on biodiversity (e.g. appropriations of land, especially of agricultural land for the construction and reconstruction of road and highway network, application of biocides in the maintenance around the infrastructure, excessive use of road salt, spread of invasive species and infectious diseases). Currently, there is an alarming situation around the plan of the import of biological fuels from developing countries, where they are produced to the detriment of natural ecosystems, tropical rainforests, etc.

## Attitudes of pupils towards motoring

In the context of the above mentioned environmental and health consequences of individualised car transport we are interested in the attitudes of the recipients of the potential environmental education, that is the pupils themselves. A part of the research presented in this paper introduces the analysis of the descriptive part of the investigation conducted for the dissertation thesis of the author. This part concerned the analysis of pupils' attitudes towards individualised car transport.

For the description of the variable "attitudes towards motoring" we defined the indicators, which are then turned into ordinal variables. In accordance with our understanding of the construct attitude (cp. NAKONEČNÝ 1998, p. 118) they are represented by the degree of agreement with the following statements:

- "It is inconvenient if you do not have a car nowadays."
- "A car should be used only when there is no possibility to use other means of transport."
- "It is essential to own a car nowadays."
- "It is cool to own a car."

To analyse the dichotomy of the attitude toward the environment and motoring we chose the relational part of the investigation dealing with the relation between "attitudes towards motoring" and "attitudes towards the environment". In the context of theory is it represented by a hypothesis:

H: There is a relationship between attitudes towards the environment and attitudes towards individualised car transport in 8<sup>th</sup> and 9<sup>th</sup> grade pupils of basic schools.

In our sample there were pupils of 8<sup>th</sup> and 9<sup>th</sup> grade of basic schools in Brno.

Distribution of the data (for N = 393) of the variable *The degree of agreement with the statement: "It is inconvenient if you are without a car nowadays."*

options	N = 393	Relative frequencies	Upper limit CI	Lower limit CI
Definitely yes		46,6	41,67	51,53
Rather yes		35,9	31,16	40,64
Rather not		11,2	8,08	14,32
Definitely not		6,4	3,98	8,82

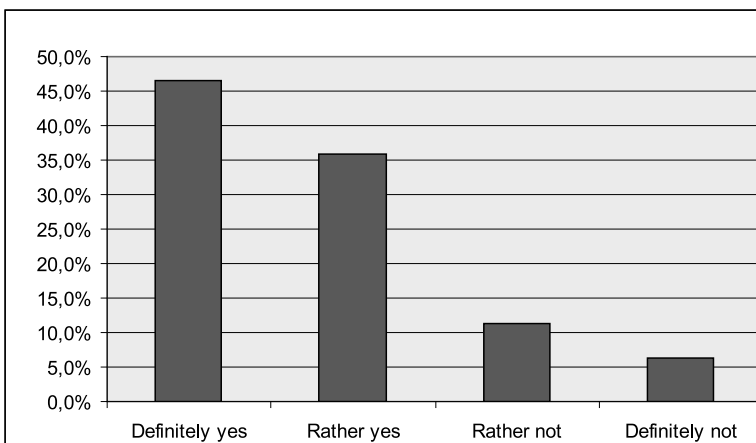


Diagram No. 2: “It is inconvenient if you are without a car nowadays.”

The modal category is the option “definitely yes” and the second most frequent category is the option “rather yes”. Therefore, we assume that pupils perceive not owning of a car as inconvenience.

The distribution of data (for N = 385) of the variable *The degree of agreement with the statement: “A car should be used only when there is no possibility to use other means of transport.”*

options	N = 385	Relative frequencies	Upper limit CI	Lower limit CI
Definitely yes		7,5	4,87	10,13
Rather yes		21,6	17,49	25,71
Rather not		40,5	35,6	45,4
Definitely not		30,4	25,81	34,99

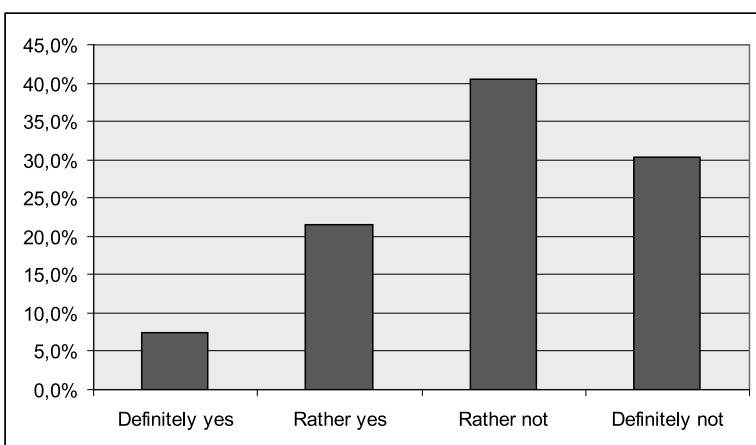


Diagram No. 3 “It is essential to own a car nowadays.”

The modal category is the option „rather not“, the second most frequent is „definitely not“. Nevertheless, 29.1 % of pupils agree that a car should be used only if there is no possibility to use other means of transport. In our opinion this is a relatively large proportion. We are based on the assumption that standard conformist attitude towards the use of car would not be significantly restricting to extraordinary circumstances.

The distribution of data (for N = 384) for the variable *The degree of agreement with the statement: „It is essential to own a car nowadays.“*

options	N = 384	Relative frequencies	Upper limit CI	Lower limit CI
Definitely yes		25,5	21,14	29,86
Rather yes		40,9	35,98	45,82
Rather not		17,7	13,88	21,52
Definitely not		15,9	12,24	19,56

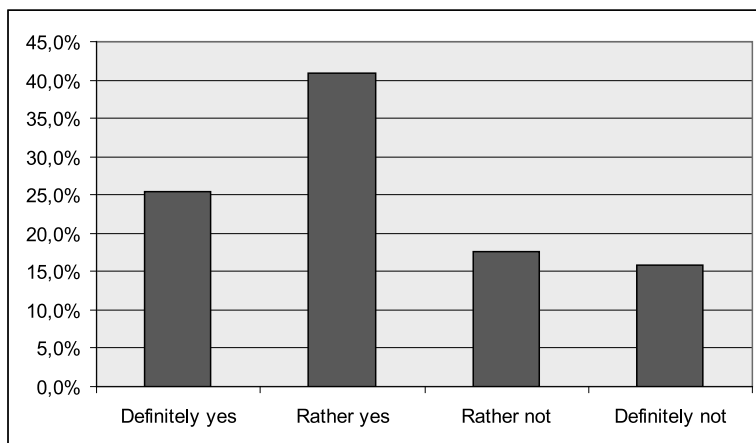
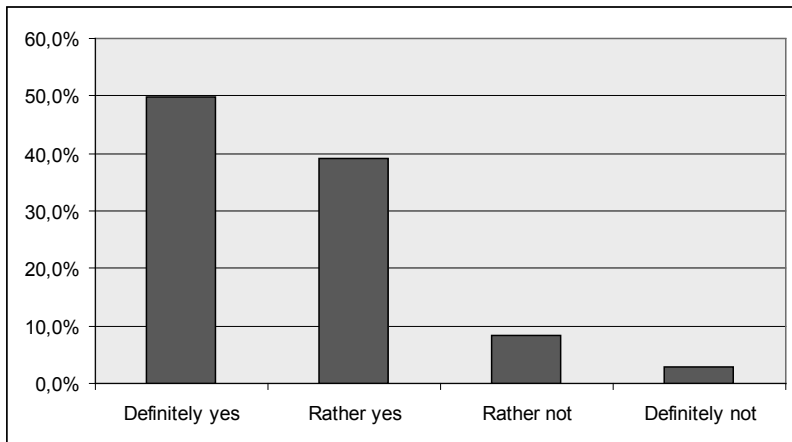


Diagram No 4: „It is essential to own a car nowadays.“

The modal category is the option „rather yes“, the second the the option „definitely yes“. It seems that ownership of a car is a „necessity“ for most respondents. 25.5 % of pupils do not take into consideration that one could live without a car nowadays.

The distribution of the data (for N = 384) of the variable *The degree of agreement with the statement: „It is cool to own a car.“*

options	N = 384	Relative frequencies	Upper limit CI	Lower limit CI
Definitely yes		49,7	44,70	54,70
Rather yes		39,1	34,22	43,98
Rather not		8,3	5,54	11,06
Definitely not		2,9	1,22	4,58



*Diagram No. 5: "It is cool to own a car."*

The modal category is the option "definitely yes", the second most frequent is the option "rather yes". Thus, most respondents identified with the above mentioned emotional statement. The desire to own a car therefore probably does not have only a pragmatic origin.

From the univariant analysis above it implies that in the context of our main indicators in our sample the "attitude towards motoring" is rather positive.

For the purposes of a bivariant analysis from the ordinal variables above we processed a metric variable AM (attitude towards motoring) in such a way that the individual variant of variables were matched with a numerical value (number of points according to the degree of agreement/disagreement with the statement). Subsequently, the points for all variables were summed up.

The same operation was conducted for other variables demonstrating the construct "attitude towards environmental protection" and so a metric variable ATEP was created. Ordinal variables it arises from (and which represent the main indicators of attitude towards the environment) are expressed by the degree of agreement with the statements:

- "People should be concerned about environmental damage."
- "I agree with the way humans treat the environment."
- "I want to live in such a way so that my behaviour is always environment-friendly."
- "I want to participate in environmental protection."

Subsequently, we examined the dependence between metric variables by means of calculation of correlation.

In the bivariant analysis for the purpose of testing the hypothesis was transformed into a zero hypothesis and then into an alternative statistical hypothesis. To measure the statistic dependence between variables Pearson's correlation coefficient was used.

H: There is a relationship between attitudes towards environmental protection and attitudes towards individualised car transport in pupils of 8<sup>th</sup> and 9<sup>th</sup> grades.

H<sub>0</sub>: The calculated value of the coefficient of the correlation does not predicate dependence between intensive variables ATEP and ATM.

H<sub>A</sub>: The calculated value of the coefficient of the correlation predicates about the dependence between intensive variables ATEP and ATM.

Based on the final correlation on the one hand we refute the zero hypothesis, but the dependence that we assume from the negative value of coefficient of correlation is *very weak*. Thus, there is a relationship (very weak, but significant on the chosen level of significance) between a negative attitude towards motoring and positive attitude towards the environment.

## Conclusion

The urgency of the problems associated with transport is undoubted as concerns (not only human) life and health. From the point of view of environmental education and health education particularly alarming is the threat to plant and animal species and irreversibility of intervention into the environment. It seems that what is unpleasant for humans and puts human life at risk is problematic for the environment, animals and plants and vice versa. Experts claim that environmental damage *“often in advance indicates and points to some negative effects of transport, which already threaten sensitive groups of people and develop in the majority after some time“* (BENDL 2008, p. 21). According to the author the environment thus plays *“a role of a guinea pig to indicate where humans should be very careful“*.

Therefore, the topic of transport is becoming a subject in education, both in the context of the environment and health. In the content curriculum there are general topics such as Human activity and problems with the environment with subtopics on transport and environment (research and development, energy resources of transport and its effects on the environment, types of transport and ecological impact, transport and globalisation), our lifestyle, environment and health (diverse effects of the environment on health, their complex and synergistic effect, possibilities and ways of health protection), health risks of car exhausts (chemistry), energy consumption in transport (physics).

On the other hand, our study shows that despite its apparent environmental and health harmfulness, car transport enjoys considerable popularity. Therefore, we assume that a more radical approach on the side of schools in the form of complex undermining of the necessity to use cars could result in resistance of pupils.

The aim of environmental education is solely to point out the problems and dilemmas that the pupils will once as adult, free (hopefully) and responsible citizens face. E.g. one of the goals of environmental education could be that the pupils realize it is no natural human need to drive to a shop 300m distant.

Pupils will have a chance to take part in the implementation of environment-



friendly transport, something that experts are already discussing e.g. using cars with lower energy consumption and emissions, using alternative fuels and renewable energy resources, implementation of stricter emission limits to restrict the production of greenhouse gases (emissions), stricter regulations in the field of production and waste disposal in transport, implementation of navigation systems, lowering the overcharged roads etc.

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## LIDSKÉ ZDRAVÍ A SILNIČNÍ DOPRAVA

**Abstrakt:** Významným faktorem ovlivňujícím nepříznivě životní prostředí a zdraví člověka je doprava. Ve stati jsou uvedeny nejdříve její environmentální a zdravotní důsledky. Dále jsou prezentovány výsledky, které vycházejí z deskriptivní části šetření věnovaného analýze postojů žáků k individualizované automobilové dopravě. V relační části je analyzován vztah mezi „postoji k automobilismu“ a „postoji k ochraně životního prostředí“. Naléhavost problémů spjatých s dopravou i výsledky

výzkumného šetření potvrzují nutnost zařazovat dané téma do vzdělávacího kurikula všech typů škol.

**Klíčová slova:** zdraví, životní prostředí, environmentální výchova, výchova ke zdraví, postoj k automobilismu