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CYCLING IN THE FUNCTION OF PHYSICAL ACTIVITY THROUGH ACTIVE COMMUTING

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Abstract

Active commuting is defined as walking or cycling to work, school, university, which makes it one of the ways to increase physical activity. The World Health Organization works on increasing the proportion of the population that meets the recommended accumulation of 30 minutes of moderate physical activity for five or more days per week, which can be achieved through active commuting, especially when using bicycles. The objective of this study was to examine the frequency of use of bicycles in the city of Zagreb and its association with the weather parameters. The research was conducted on a sample of 153 inhabitants of a building in Zagreb, in the urban area connected with the entire city via bikeway network. Data on the frequency of active commuting and weather conditions were acquired in a two-week period. Assumptions underlying this research are that the bicycle culture in the context of active commuting in Zagreb is not on the level of Western European cities and that bad weather conditions have significantly negative impact on the frequency of cycling during commuting. Bicycle owns 19.6% of the examinee. For active commuting bike is used by 6.36% of working-age employed individuals. The bicycle culture in the context of active commuting in Zagreb in comparison to Western European cities proved to be insufficient. Strong correlation was found between the amount of rain and the number of bikes in use ($r = -0.64$), which confirms the second assumption underlying this research. Proper and safe use of bikes in active commuting requires users' awareness, but also the public support through urban and transport policies; systematic and with a range of developments, from raising the quantity and quality of cycling infrastructure, to promotional campaigns, in order to improve public health.

Key words: *active transportation, bike, health, chronic non-communicable diseases, prevention*

Introduction

Physical activity (PA) that has the optimal intensity and continuity, has potential to reduce the incidence of chronic non-communicable diseases. Insufficient PA significantly contributes to an increase in health problems in modern societies where sedentary behaviour has become an integral part of everyday life (Buekers et al., 2015). According to the World Health Organization (WHO), the insufficient PA is defined as less than five times with 30 minutes of moderate activity per week, or less than three times with 20 minutes of high-intensity activity per week (Alwan, 2011). Physical inactivity is one of the most important health challenges of the 21st century because of its impact on chronic diseases with high mortality. Despite the high health burden resulting from the lack of PA, a lot of money is still spent on treatment, but only a minor part on the disease prevention (Buekers et al., 2015). Ogilvie et al. (2004) emphasise increasing PA in the population as a first-line option for improving public health. In the modern way of life, it is quite difficult to spare time in PA to improve health. This opens the opportunity for active commuting (AC): a term defined as walking, cycling and public transport utilization to work or school (Xu et al., 2013). Such active mobility related to transport is appropriate for integration of PA as a part of the daily routine (Dons et al., 2015; Xu et al., 2013). Accumulated contributions of PA through AC could help to achieve the recommended guidelines of 30 minutes of PA per day. Several authors emphasise the health benefits of AC (Merom et al., 2008; Rissel et al., 2012; Wanner et al., 2012). Wen and Rissel (2008) found travelling to work by car significantly correlated with the incidence of obesity, and that people who cycle to work are significantly less exposed (39.8%) to be overweight. Furthermore, transportation policies are increasingly trying to reduce traffic congestion by stimulating people to switch from cars to alternative modes of transportation, such as cycling (Ogilvie et al., 2004). Reducing the vehicle use and increasing the distance travelled by walking and/or cycling could have significant health benefits through reducing air pollution in the urban environment and against the prevalence of physical inactivity and associated manifestations of chronic non-communicable diseases (Fraser & Lock, 2011). The integration of cycling in the daily routine is a potential approach for increasing PA, appropriate for many individuals who spend 30 minutes or more in commuting. Health aspects of daily cycling took the attention of the health sector in order to increase the level of PA, thus the transportation and urban planning sectors in order to verify the investment in cycling and associated infrastructure (Götschi et al., 2016). Dons et al. (2015) provide that in addition to the direct health benefits of PA, active mobility is associated with mental health. In their systematic review of health perspectives of cycling as a part of daily life, Götschi et al. (2016) concluded that most studies demonstrate greater benefits of PA, in relation to risks of accidents

and exposure to air pollution. Authors state that the combination of such transport and PA does not cost a lot and does not require special skills, which makes it a suitable modality for large segments of the population.

The transition from secondary school to university is one of the major life adjustments, usually accompanied by a PA reduction (Molina-García et al., 2013). Such a decline in PA can potentially become irreversible: adulthood often brings one-way trends – after passing the driving test and buying a car, bike goes dump or remains a relict of the childhood, or in the best scenario, an element of leisure time and recreation. On the other hand, the implementation of a healthy lifestyle through raising awareness of the advantages of active transport can provide lifelong benefits in the prevention of chronic diseases. Previous perception of a car as a necessity, even a status symbol, and alternative, of the bicycle as a working class transport modality, has shifted greatly; today the proportion of cyclists in traffic is one of the indicators of development of the country, through the prism of traffic culture, health and environmental awareness.

The objective of this study was to examine the frequency of use of bicycles in the city of Zagreb and its association with the weather parameters. Assumptions underlying this research are that the bicycle culture in the context of AC in Zagreb is not on the level of Western European cities and that bad weather conditions have significantly negative impact on the frequency of AC using bikes.

Methods

Research on the use of bikes for AC was carried out in the city of Zagreb, during 10 working days, on a sample of the middle city district building, with 153 inhabitants. The building has a ground floor bike garage, with 50 bike wall hangers. The urban district is longitudinally and transversely well connected to a city centre and the suburban area, via bikeway network. Apartments in the building do not have a balcony nor a lodge, so it is a high probability that all bikes are located in the garage. Data collection began on Sunday, April 10, 2016 at 10 pm, with the assumption that in the mentioned period probably all the bikes are stored. In the next 10 working days number of bikes in the garage was registered at 10 am, with the assumption that all the people who use their bikes for active transport, went to work. The procedure was repeated every day at 10 pm. During this period, weather forecast was monitored consistently at 10 am. The data on temperature, relative humidity and pressure, as well as data on precipitation and wind, were observed and recorded. Evidence on the bicycles that were used in the reporting period led the research to the bike owners: information on their age, gender, professional qualification, smoking habits and location of the workplace were obtained via interview. Data on the bike usage could not be collected over the weekend, since bicycles were then randomly taken in different time of day, which suggests their use mainly for the purpose of leisure and recreation, but not AC.

Results

In a sample of 153 inhabitants of the building, there were 30 bikes recorded. According to the above, every fifth tenant (19.6%) possesses a bike. In this study conducted in 10 working days, mean of 4.2 bicycles were in use (median 4), minimum 2, maximum 8, which match to 2.74% of the population of the building. If the results complete with the data of the Croatian Bureau of Statistics data on the working age population in the first quarter of 2016, according to which the employees are 43.2% and 7.8% unemployed and 49% inactive, the approximate number of 66 employees live in the building. According to that, the estimation is that the bike for everyday AC uses every 15th tenant in average, or 6.36% of the employed working-age population. In this research, mean age of the active commuters was 31.25 years, 62.5% were male, 75% have university degree and 25% secondary school degree. All are non-smokers. According to the place of work, an average of 9.4 km travel to work and back in total is calculated. That implicates more than 30 minutes of moderate PA per day. The mean temperature was 13.7 °C at a relative humidity of 64.3% and pressure 1016.67 hPa on average. Such weather conditions are appropriate for cycling. Since distribution showed normality, Pearson's coefficient of correlation was used for data processing. The strong negative correlation ($r = -0.64$) was found between rainfall and the number of bikes in use. Other weather parameters were not significantly associated with the frequency of using bikes.

Discussion

Physical inactivity is one of the leading risk factors for chronic non-communicable diseases (Dons et al., 2015). Mueller et al. (2015) point out that 3 hours of cycling per week can reduce 28% of the risk of the most common causes of death.

Based on the results of this research, it is estimated that one in five adults in Zagreb owns a bike, and for AC average usage is 6.36% among working-age employees, while in the literature (Kuhnimhof et al., 2010) data for Germany shows that almost a third of adults uses a bike as a transport modality during the working week. Oja et al. (2011) point out that utilizing bike through AC just for few kilometres, can significantly improve cardiorespiratory status in adults who are not in good shape. By increasing the distance, improvement can reach 30%. Progress is minor but still significant among individuals with moderate and high level of fitness (Oja et al., 2011). Given the many positive indicators related to AC, the question arises: why car remains dominant transportation option. According to Kuhnimhof et al. (2010), the probability of choosing a motorized mode of transportation raises with increasing distance. Bad weather conditions also reduce the

probability of choosing non-motorized modes. Cycling is negatively determined by weather conditions more than walking. Apart from the quantity and quality of transport infrastructure, one of the main obstacles for cycling within the AC are inadequate conditions for leaving bikes securely. Molina-Garcia et al. (2013) suggest one solution to this aspect: the public bike-sharing program, which consists of a bikeway network with locations where bicycles can be rented and where they are securely parked. In Zagreb, there is such a public bike-sharing network for a while, but the number of locations to rent or leave the public bike is still insufficient and too far away from most workplaces, schools and universities, which is an essential criterion to stimulate a significant number of people toward that option of active transport.

Relation between health benefits and the risks of accidents and inhalation of polluted air was analysed in individuals who had changed the commuting modality from car to bicycle. On the basis of the research it is estimated that life expectancy related to increased PA is significantly higher (3-14 gained months), than it could be reduced due to increased respiration of polluted air (0.8-40 days) and to a higher potential for traffic accidents (5-9 days) (Oja et al., 2011). Xu et al. (2013) emphasised that the risk of injury per hour of AC, compared to recreational and professional sports, is relatively low. Health factors of increased PA exceed the risks significantly. Therefore, the promotion of active transport should be encouraged (Mueller et al., 2015). Recommendations for PA suggest duration of the activity in units of at least 10 minutes (Alwan, 2011). There are theories that regular cycling as on a daily or weekly basis, is more important for health than periodic vigorous activities (Götschi et al., 2016). Compared with walking, cycling health benefits are greater, due to a higher activity level (Oja et al., 2011). However, the causal nature of the associations remains unclear. The benefits resulting from cycling greatly depend on how active cyclists would be without cycling (Götschi et al., 2016). More generally, it is not known whether it appears to the acceptation of AC in groups that are already physically active, which gives a limited effect on physically inactive groups (Merom et al., 2008). Even high quality cross-sectional studies do not allow making conclusions regarding causality, and even the direction of correlations. Wanner et al. (2012) are discussing several limitations of the existing evidence which need to be taken into account in the review of the research: research design (studies are mostly cross-sectional), control of confounding factors such as other forms of PA, and the use of robust evaluation methods of active transportation based exclusively on instruments such as interviews, because there are still no standardized objective assessment tools.

Infrastructural separation of cyclists from traffic through the bikeways can play a key role in attracting more people to cycling as a form of AC, as well as increasing safety. The main reason to continue the AC cycling as a strategy for improving public health is its applicability to large groups of the population and to all age groups. If the stimulative trends in order to reduce population's physical inactivity continue, while cycling will become safer, the benefit-risk ratio will improve further (Götschi et al., 2016). Alternative modes of transportation must be available and users must perceive them as the optimal alternative to the car (Lavery et al., 2013).

The drawback of this study is the robustness of the methodology. In future research it is necessary to improve the objectivity of the assessment, including aspects emphasised by Wanner et al. (2012) - consistent control of other forms of PA in order to assess the independent effect of AC.

Conclusion

In this paper, current knowledge about the broader context of AC is presented. In order to compare the scientific knowledge and present situation and perspectives for AC in in the city of Zagreb, a study of the frequency of use of bicycles and its association with the weather parameters was conducted. The research extended for two weeks, on a sample of the building with a bike garage, in the urban area well connected with the entire city via bikeway network.

The assumption underlying this research, that the culture of cycling in the context of the AC in Zagreb is minor in comparison to Western European cities, was confirmed. The strong negative correlation ($r = -0.64$) found between the rainfall and the number of bikes in AC use, confirmed the hypothesis that bad weather conditions have significantly negative impact on the frequency of using bikes for AC.

The existing evidence-based knowledge supports promotion of cycling as an important contribution to public health improvement. The causal relation between active transport, PA and health, should be comprehensively investigated. More research is needed, longitudinally designed, with improved, objective assessment methods. Further research should focus on raising awareness of cycling in the function of PA through AC to maintain a long-term behaviour.

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