Cycling to School: Exploring Key Factors Influencing School-Going Children's Mobility Choice to Cycle in Tallinn, Estonia

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Abstract: Cycling and other active travel modes have dominated sustainable transportation policy agenda of many cities worldwide. Cycling is deemed beneficial for individuals' health and well-being while contributing to liveability. While Amsterdam and Copenhagen are considered frontrunners in cycling, others are only taking their first steps. Tallinn, Estonia belongs to the latter category, setting up their first Cycling Strategy in 2018. Amongst other measures, the strategy aims to make cycling safer and more attractive in the vicinity of schools in order to increase the share of cycling to school to 25% by 2027. This demographic group are seen as a crucial to influence the potential future of Tallinn's cycling culture. Despite the abundant literature on cycling, there is little to no focus on children in aspirational cycling cities. This research explores factors that influence cycling to school in Tallinn among children in the ages of 13-16. The research includes street observations, a survey (n = 511) at various schools and focus groups sessions with children, parents and mobility experts. The findings support the need for comprehensive strategies including cycling infrastructure modifications and convenient cycle parking facilities together with promotional campaigns designated for children and parents.

Keywords: school-going children; school travel; cycling culture; sustainable mobility

1 Introduction

Cities are increasingly investing in active mobility strategies encouraging walking or cycling in place of private car travel (European Comission, 2016; Johansson, Laflamme, & Hasselberg, 2012). The expected benefits associated with active mobility are predominantly for increasing health and well-being. The attraction here is twofold. Firstly, cycling is considered the most sustainable transport mode in cities, also suitable for longer trips usually taken by car or public transportation. As Pucher and Buehler (2017) state: "Cycling is environmentally, socially and economically sustainable" (p.689).

Next, children are increasingly performing sedentary activities and child obesity is a growing health care concern. Walking and cycling to school offers children higher levels of physical activity, but also psychological gains such as having more social interactions. Simultaneously, a reduction in the number of parents driving their children would make active transportation safer, but also benefit the environment (Easton & Ferrari, 2015; Ermagun & Samimi, 2015; Helbich et al., 2016; Larouche, Stone, Buliung, & Faulkner, 2016; Mitra, 2013).

Most existing literature on cycling among children focuses on the USA, Canada and England, but also Denmark and the Netherlands which are more advanced in cycling. In comparison, Tallinn, Estonia where approximately

1% of all trips is done by bicycle (Maanteeamet, 2017) seems to not be addressed. This could be expected in a city where car dominate, public transport is free of charge and snow is predicted in winter months (Cats, Susilo and Reimal, 2017; Hess, 2017; Poltimäe and Jussi, 2017, Leesment, 2018). However, weather considerations aside, in comparable cities such as Helsinki or Gothenburg 11% and 8% of all trips are done by bike respectively (City of Gothenburg, 2015; Maanteeamet, 2017).

Tallinn adopted the Tallinn Cycling Strategy in 2018 which aims at 11% of cycling of all mobilities, and 25% of cycling of all mobilities for travelling to and from school (Jüssi et al, 2018). School children are an important focus of the strategy as they are seen as the future of Tallinn's cycling culture. However, as there is such a low percentage of cyclist, it becomes important to understand what the barriers to cycling for school-going children could be. These insights can offer valuable information for drawing up comprehensive measures for reaching the goals set in the cycling strategy.

In collaboration with the Tallinn Cycling Coordinator, this research therefore aims to understand which key factors influence school-going children's mobility choice for cycling to and from school in Tallinn. Through a mixed methods approach, this research discovers the factors influencing cycling to school in Tallinn, including a survey of 511 school-going children, focus groups with pupils, parents and experts to isolate the factors and observations of the current conditions in Tallinn in relation to these factors.

2 Theoretical framework

In order to understand children's mobility choice to cycle, this chapter first explains travel behaviour in boarder terms and then narrows it down to children. This research is based on the model of school transportation by Mitra (2013) which is explained here. Finally, the key factors that have found influencing children's mobility choice in other studies, are shown.

2.1 Travel behaviour & children's travel choice

Before making school travel choice explicit, first an understanding of general travel behaviour has to be established. The NOA model identifies needs (N), opportunities (O) and abilities (A) as determinants of travel behaviour. Needs describe motivational factors, social factors and emotions. Opportunities include available transportation modes and travel distance, and abilities looks at monetary and time resources, but also skills and capacity to use different travel modes. Needs, opportunities, and abilities are influenced by societal developments, such as economic growth and changes in values and norms. For instance, economic growth enables more people to own a car (Dijst et al, 2013).

In contrast to adults, children's mobility is largely determined by their independence from their parents or caregivers. *Children's Independent Mobility* (CIM) is a concept that tries to capture the extent of this independence by looking at the freedom children have to leave their home on their own (O'Brien, Jones, Sloan, & Rustin, 2000). CIM includes activities that children can do independently, such as crossing main roads, travel to places aside school, travel home from school, travel by public transport, bicycle and go out after dark (Carver *et al*., 2014).

Children's independent mobility is linked with *Active Travel to School* which means walking or cycling to school instead of taking the car or public transport which are passive transportation modes (Easton & Ferrari, 2015; Lee, Orenstein, & Richardson, 2008). Active school travel has many benefits for the child, including higher levels of physical activity and psychological gains such as potentially having more social interactions. On the contrary, children who are chauffeured are more likely to perform sedentary activities and have weight issues (Easton & Ferrari, 2015; Ermagun & Samimi, 2015; Helbich, 2017; Larsen, Larouche, Buliung, & Faulkner, 2018; Oja et al., 2011; Schoeppe et al., 2013).

Researchers who have studied active travel to school, agree that no single factor can determine active school travel. However, factors that have more prominent influence on active school travel are similar across studies. These key factors are:

- distance to school (Broberg & Sarjala, 2015; Ermagun & Samimi, 2015; Mitra & Buliung, 2015);
- road, traffic and perceived safety (Broberg & Sarjala, 2015; Carver, Timperio, & Crawford, 2013; Johansson et al., 2012);
- street connectivity (Broberg & Sarjala, 2015; Helbich et al., 2016).

Nevertheless, experience from various countries has shown that investments in infrastructure alone have not brought the desired outcomes and thus educational programmes are also essential in influencing children's travel behaviour (Deka, 2013; Mitra & Buliung, 2015; Pucher et al., 2010).

Factors influencing active school travel also vary between younger children and the adolescences. Both Mitra (2013) and Johansson et al. (2012) agree that active commute to schools decreases as children get older. While younger children generally prefer to walk to school or use the walking school bus, the youth tend to prefer public transport (Mitra & Buliung, 2015; Hinckson, 2016). Hinckson (2016) also found that both younger and older children enjoy traveling with their peers, although they use different modes of transportation.

2.2 A behavioural model of school transportation

This research adopts Mitra's model of school transportation (2013) and uses the four domains of *external factors* (1), *urban environment* (2), *household* (3), *and child* (4) (Figure 1) to identify factors influencing active school transportation in Tallinn. However, in its simplicity, it excludes socio-demographic and economic indicators for travel behaviour.

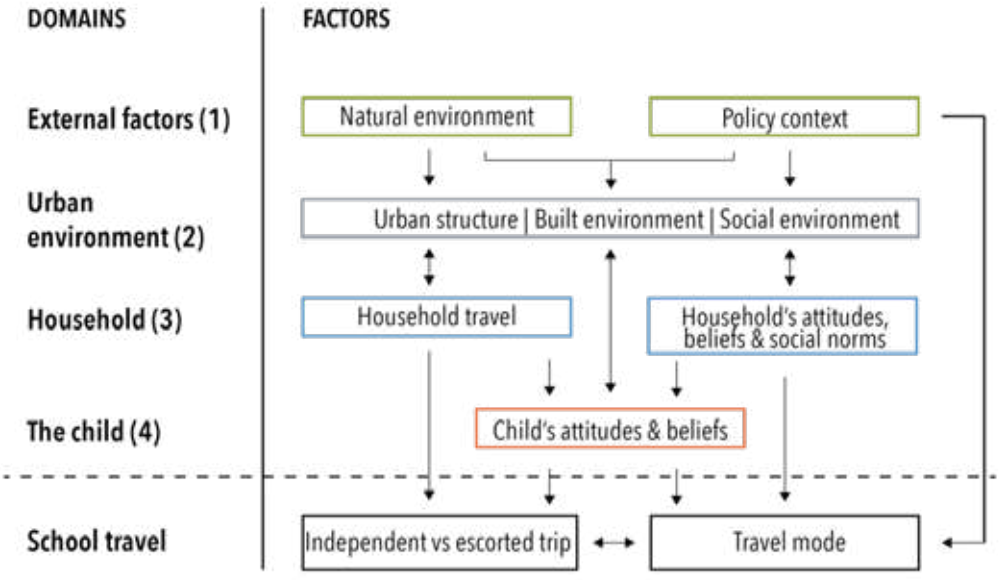

Figure 1: A simplification of Mitra's (2013) model of school transportation.

The first domain – *external factors* - include the natural environment and policy context. A city's topography, weather and climate, influence active school travel (Mitra, 2013). Studies from the Nordic countries report a

decrease in cycling rates in winter months (Larouche et al., 2016). However, if children are used to cycling on a daily basis, they are less likely to change their habits due to the change in season (Helbich et al., 2016; Larouche et al., 2016). Policies such as the possibility to use a school bus and provision of bike parking at school, can encourage or discourage cycling.

The second domain - *urban environment* – includes the urban structure, built environment and social environment. Here, Mitra (2013) identifies five links between neighbourhood characteristics and school travel outcome – proximity to school (1), traffic and personal safety concerns (2), connectivity of streets suitable for active travel (3), comfort and attractiveness of active travel modes (4) and opportunity to produce and maintain social capital (5), such as cycling together with other children.

The third domain – *household* – says that social norms and values, and the travel options contribute to school mode choice. Children are more likely to engage in active transport if they live in a car-less household. Relatives, friends and even teachers may disapprove parents' choice for active school travel (Bennetts et al., 2018; Mitra, 2013). General household activity, such as driving to work in the morning makes it convenient to drive the child to school (Mitra, 2013), but if parents are confident about their child's physical and cognitive capabilities, and aware of the benefits of active transport, they are more likely to encourage active school travel. plays a role.

The fourth domain - *the child* – says that children themselves have an opinion about their transportation options and consider their cycling capabilities and efficacies. These attitudes also change over time as they become more independent in their teenage years and make their own decisions about their mode of transport (Mitra, 2013). Veitch et al (2017) found that if children enjoy cycling, it contributes largely towards their traveling behaviour.

3 Methodology

The research requires both quantitative and qualitative methods to understand what factors influence school travel (quantitative/qualitative), and how and why they influence school travel (qualitative) in Tallinn.

3.1 Ethics approval

This research is concerned with children who are considered vulnerable groups according to the European Commission. A research protocol was submitted to and approved by the Wageningen University and Research Social Sciences Ethics Committee who declared the research satisfactory in terms of dealing with ethical issues and its compliance with the Netherlands Code of Conduct for Research Integrity.

3.2 Observations in Tallinn

Observations were carried out around three schools in Tallinn in the morning before the start of the first class. Observation forms where used to note down the weather conditions, number of cyclists entering school premises, other active modes besides the bike, location of bicycle parking and number of bikes at the bicycle parking. Photos were taken of the cycle parking and infrastructure surrounding the school. See Figure 2 for overview of school locations.

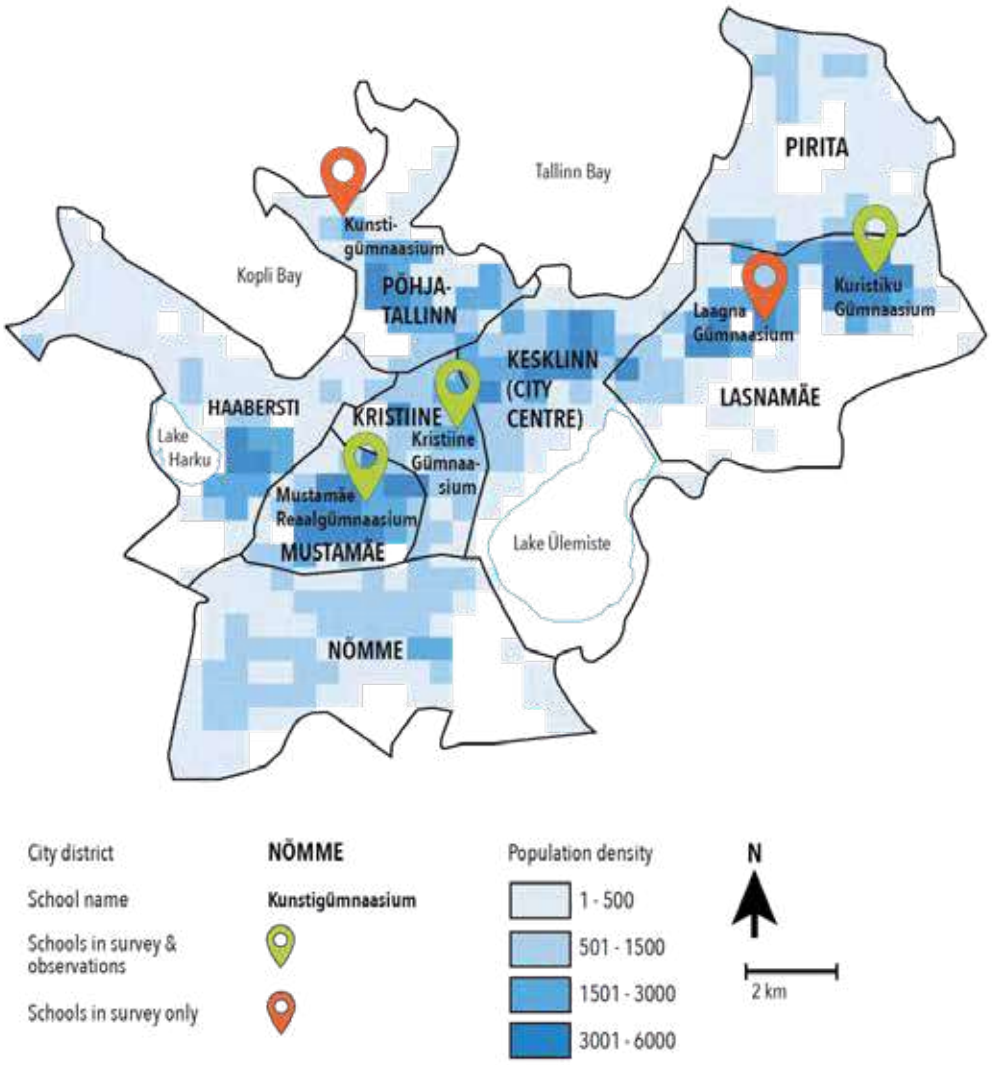

Figure 2: Tallinn – location of schools included in observations and survey

3.3 Survey among school-going-children in Tallinn

A survey was carried out among 13-16-year-old (forms 7-9) school-going children to gain a general understanding of pupils' attitudes and beliefs about cycling and barriers for cycling to school. The survey was carried out at five schools, resulting in 511 responses. This represents 5% of school-going children in Tallinn in forms 7-9 (Tallinn Education Department, 2018).

Topics covered in the survey included bike ownership, usual school transport mode, distance to school, uptake of cycling to school and different barriers to cycling. The survey was carried out as part of a promotional activity offered to schools by the Tallinn Cycling Coordinator. The interactive survey used KahootTM as a survey tool, included 9 multiple-choice questions and lasted about 10 minutes.

3.4 Focus groups in Tallinn

Once the surveys had been completed, three focus groups were carried out to gain in-depth information about additional barriers to cycling, and how and why these barriers influence cycling to school. Focus group participants were identified via tutors of grades 7-9 at various schools and through the network of the Tallinn Cycling Coordinator.

The three focus groups included:

1. School-going children aged 13-16 (6 participants);
2. Parents of school-going children (3 participants);
3. Tallinn's mobility experts (6 participants).

5 Results

The observations, survey and focus group sessions allowed to gain a comprehensive understanding of factors that influence cycling to school in Tallinn.

5.1 Cycling to school in the cityscape (observations)

The school observations showed that the majority of cyclists were younger children. Next to cycling, the smaller children also used the kick bikes which is a more common mode choice than the bicycle. Mountain bikes dominated in the cycle parking. Cycle parking is provided at all schools; however, the location, size and security level of each facility varies (see Figure 3 for overview of cycle parking facilities). All facilities only allow front wheel parking, which at one school meant that more bikes were parked at a wheelchair rail where bikes could be locked from the frame. Around the schools, speed limitations are put in place.

Figure 3: Impressions of cycle parking at schools in Tallinn

Observations were made about the cycling infrastructure while cycling in the school's neighbourhoods (see Figure 4). First, existing cycling paths are almost always shared with the pedestrians. However, in many places these paths are narrow which mean that there is little room for cyclists to pass pedestrians. When these slow mode paths pass bus stops, there is virtually no space left for cyclists.

Second, when crossing large intersections, in most cases it is necessary to stop at least twice to cross the street because the traffic lights are not synchronized. In these situations, the cyclist has to stop in the middle of the street on an island which is often just narrow enough for the bike to fit.

Figure 4: Impressions of cycling infrastructure in Tallinn

Third, many of the cycling paths are in poor condition and in some places signage on the roads has faded. Also, in some cases when crossing a street, the cycling path continues, but the curb stone is so high that it is not possible to get on the path while on the bike. Cycle paths can also be found ending suddenly, which proves the lack of connected cycling network in Tallinn.

Finally, no bikes where seen parked outside apartment buildings. Cycle parking facilities outside of apartment buildings were not spotted, although bikes were seen parked on balconies.

5.2 Cycling trends among school-going children (survey)

The survey resulted in 511 responses from five schools in Tallinn. Among the children, 66% have a bike, 13% do not have a bike and bike ownership is unknown for 20.4% (question was not included for one school) (Figure 5). When asked how they usually go to school, the majority of 47% says they go to school on foot, followed by 34% who take the public transport. 11% are taken to school by car and only 35 children (7%) have chosen the bike as their mode of school transportation (Figure 5).

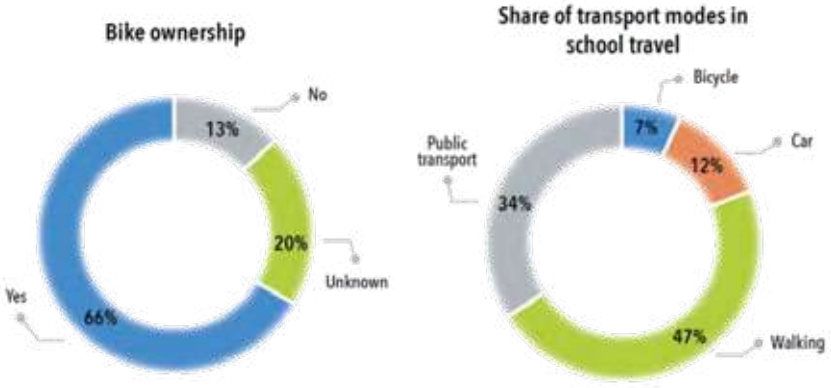

Figure 5: Bike ownership and share of transport modes in school travel

Combining data about distance to school and transport mode (Figure 6) shows that pupils living closest to school are most likely to walk while the ones living furthest away are most likely to take the car or public transport. Meanwhile, the ones cycling to school live anywhere from less than 10 minutes away to more than 30 minutes walking away from school.

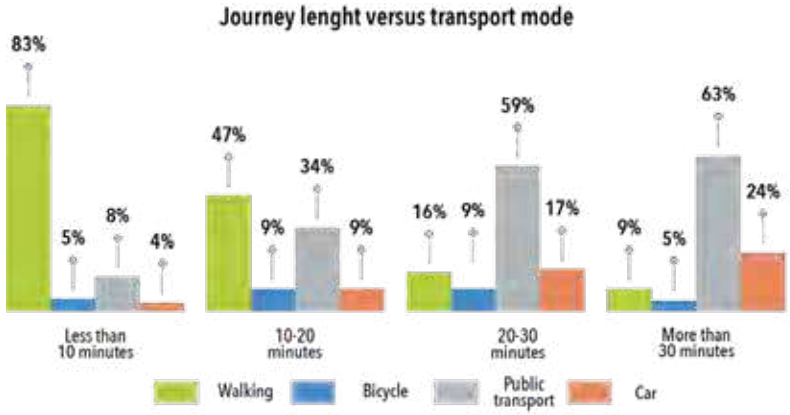

Figure 6: Journey lenght vs transport mode

The final part of the survey focused on different factors that hinder pupils cycling to school. Figure 7 presents ranking of these factors for two groups – for all pupils who participated in the survey and for potential cyclists (have a bike; would like to cycle to school; currently use other modes). The top three factors are the same for both

groups, stating that the weather, bike storage at home and the fact that car or public transport are more comfortable are the most chosen factors. The least chosen factor for both groups is social influence by their friends and peers.

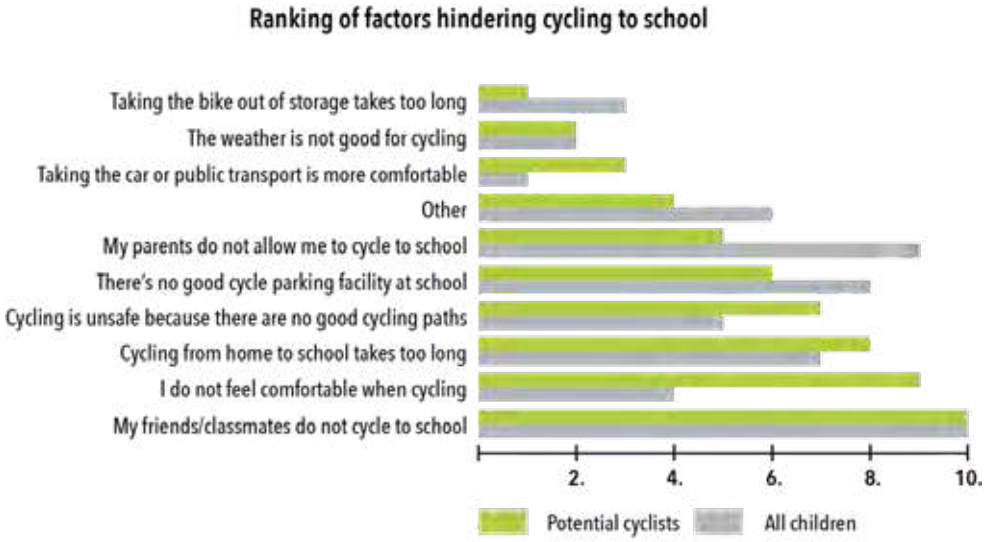

Figure 7: Ranking of factors hindering cycling to school

Overall, the data shows that the potential cyclists are more concerned about cycling facilities and are constrained by their parents, while all pupils are more concerned about safety and comfort of cycling. This could mean that the potential cyclists have more knowledge about the actual cycling conditions and are less worried about the safety issues and would like to have better parking facilities both at home and school.

5.3 In-depth exploration on cycling to school (focus groups)

In order to gain further insights into cycling and expand the information gathered through the survey and observations, focus group sessions with parents, children and Tallinn mobility experts were held. The results of the sessions were categorized according Mitra's model (2013) and divided into external factors (1), urban environment (2), household (3), and the child (4).

External factors

The weather conditions in Tallinn prove to be a crucial barrier for cycling to school. Parents admit that cycling is unlikely during winter months and rainy days. However, for children it could be more the perception of unsuitable cycling conditions than the actual weather of the day. Experts add that weather can be an even bigger barrier for adolescents than younger children, because it could imply wearing different clothing. The children themselves state that they would only cycle to school in warmer months.

"People already have attitudes about the weather, especially in the teenage years. Smaller children wear rain clothes, but in that age, you still want to wear jeans and white sneakers, so how can you go by bike."

- Tallinn Mobility expert 3-

The cycle parking facilities provided by the school influence cycling to school. The parents state that a child should feel confident about leaving their bike at the cycle parking. Three experts add that the location of the parking facility is crucial - preferably at a visible spot right next to the school's entrance.

The Urban Environment

Cycle parking is considered a major issue for people living in apartment buildings. Since most apartment buildings do not have cycle parking facilities, bikes are kept in the basement or inside the apartment. However, the basements are small and narrow which makes getting the bike out difficult, and also unsafe. Parents and experts agreed that it is likely that pupils prefer to walk to school instead of cycling if getting the bike out and locking it at school takes more time than walking.

"The one who is going to school on foot lives so close that there's no point to go by bike. Our aim is not to make children who walk one kilometre to cycle. But taking the bicycle out of storage and locking it (at school) takes proportionally too much time."

- Tallinn mobility expert 1 -

The three parents agree that a prevailing issue in Tallinn is the lack of cycling infrastructure and cycling culture. Although the infrastructure exists, many bike paths are not connected to each other or end suddenly. Cycling on the road is not favoured by any of the parents and it is a shared opinion that cycling smoothly is not possible due to multiple road crossings and traffic lights. Lack of cycling culture and lack of continuous paths could be the reason why pedestrians do not walk on their side of the shared paths and thus make it more complicated for cyclists to pass.

"Usually there's a mom with a buggy on one hand and a dog in the other, walking all over the shared path. You can see for yourself how you pass them."

- School-going child 1 -

Regarding infrastructure around schools, two experts stated that attractive and well-maintained school cycling routes are essential. The main cycling routes leading to school in the first 200 metre radius from the school should be inspected and retrofitted since that is the area that is used by most children.

Two parents add that arriving to school by bike in the morning is dangerous because many parents bring their children to school by car and drop them off right at the school's front door. The same issue comes up also at the experts' session. A "drop-off" zone further away from the main entrance would be helpful to improve the safety situation according to the parents and experts.

"At the same time, there are a lot of cars. Estonian schools have effectively avoided a so called „kiss and fly "zone where you could say bye and go, there's no place for that. The area in front of the school is full of cars and it is dangerous to go through by bike."

- Parent 1 -

Household

Two parents state that they are not bothered that their children do not want to cycle to school. One of the parents said her children would be too distracted on a bike. Another one mentions that she knows exactly how her daughter behaves in traffic, and thus feels comfortable with her cycling alone. The parents do not actively encourage thir children to cycle to school.

"It's very important that (cycling to school) seems safe for the parents. Even when a child wants to (cycle to school), then if for a parent the journey doesn't feel safe, the child will not be allowed to cycle."

- Tallinn mobility expert 2 -

All parents agree that if a parent does not cycle, their perception of traffic safety is low. This statement is also supported by four experts. The experts conclude that working with parents on their attitudes about cycling is crucial in getting more children to cycle to school.

Children say that none of their parents have permitted them from cycling to school due to unsafe conditions. However, their parents would not allow them to cycle to school because they have expensive bikes. The ones cycling to school use cheaper bikes for the purpose. The parents agree with this reasoning.

Parents' willingness to take their children to school by car influences children's mobility choices. One of the parent states that she used to chauffeur her children since school was on her way to work. However, all parents are aware that it is a major issue for safety in the morning and wish the parents would drop off the children a bit further away.

The Child

While parents can influence the child's mobility decision, it is clear that the children themselves, especially in adolescent years, have an opinion about how they go to school. One of the parents says that his daughter does not acknowledge cycling in the cityscape although she does like to cycle for recreation. The reason for this could be that children are not aware of the fun benefits of cycling.

My 15-year old does not bike to school because she does not like it. She likes to go on longer bike hikes, but does not consider the bike as a mode of transportation in the city, even though we as parents are an active example.

- Parent 1 -

When reflecting on the outcomes of the survey, the experts have difficulty believing that children are not influenced by their peer. Instead, they suspect that the pupils cannot objectively assess their behaviour.

The experts agree that all kind of supportive information and campaigns could lead to more children cycling to school, but especially in reducing the number of pupils being brought to school by car. They propose that a campaign similar to the on-going "smoke-free classroom" could be implemented either in warmer school months

or at the same time with the Tallinn's Sustainable Mobility month. "Car-free classroom" would entail that it is up to the child to choose which mode of transportation they choose, because the aim is not to get everyone to cycle, but simply move more.

6 Discussion

External factors

Adolescence in Tallinn consider the weather as the main barrier for cycling to school. This is explained as Tallinn does experience harsh winters and a lot of rain in autumn. However, parents and experts are certain that children may associate cycling only with sunny weather. Although Mitra (2013) and Helbich (2016) state that changes in season have little effect on changing mode choice, weather is indicated as a key factor for active mode choices in Czech Republic (Hollein et al., 2017) that has comparable weather patterns to Estonia.

As distance to school is considered the most prominent barrier to active school travel, policies on parental choice for schools (Easton & Ferrari, 2015) and the school's catchment area (Mitra, 2013) can determine how far children live from their schools. This study purposely opted for schools in Tallinn with a local catchment area and thus a high share of active travel was found in the survey. Different results would be expected if the survey included schools located in the city centre that attract pupils from across the city.

Public transport is free of charge for school-going children in Tallinn. Therefore, it is common for the youth to opt for this more comfortable option as they become more independent (Mitra, 2013; Mitra & Buliung, 2015). Although generally taking the public transport allows some walking, experts believe that pupils opt for public transport even on shorter distances that would be suitable for both walking and cycling. Similar findings have been discussed in Finland (Broberg & Sarjala, 2015).

Cycle parking facilities at schools was a much-discussed topic. Pupils in Tallinn generally regard cycle parking not sufficient and thus opt for other modes. Observations showed that in all schools locking the bike was only possible from the front tire. According to Mitra (2013), provision of cycle parking is part of the schools' mobility policy. Hinckson (2016) found that in schools where active mobility initiatives were not implemented, pupils found cycle parking limited and not appropriate for use. Together with low security measures, these conditions prevented pupils from cycling to school.

Urban Environment

A prominent issue in cycling in Tallinn is the lack of cycle parking facilities in apartment buildings where taking the bike out of storage takes too long for daily use. Previous studies have not elaborated on parking facilities at home. However, Kaplan et al (2016) found that in Denmark children living in an apartment are less likely to cycle and more likely to walk. Similarly, active commute was found more prominent in children living in an apartment in Sweden (Johansson et al., 2012). Contrarily, Broberg & Sarjala (2015) report that children living in private houses in Finland are more likely to take up active transport, because the smaller blocks provide a more suitable environment for walking and cycling.

In Tallinn, pupils living in less dense neighbourhoods are expected to cycle more, consistent with the Finnish study. This could be related to having an easy access to a bike, but is likely linked with the reduced availability of bus stops in such neighbourhoods similarly to Finland (Broberg & Sarjala, 2015). This research did not ask pupils to specify their living condition in the survey. Nevertheless, the findings indicate that one of the reasons cycling uptake may vary between private housing and apartments is the availability and quality of cycle parking.

Next, the survey in schools clearly indicated that most children travel to school actively if they live within a 30-minute walking distance from the school, while cycling is more likely in the 10-30-minute range. This corresponds

to findings of many studies that report that distance between home and school is the key barrier for active school commute (Broberg & Sarjala, 2015; Carver et al., 2014; Deka, 2013; Helbich et al., 2016; Hollein et al., 2017).

Regarding cycling infrastructure, this research found availability of connected and safe cycling paths, and its strict separation from pedestrians crucial for enabling cycling to school. Connectivity and traffic safety aspects have been reported as significant variables in many studies (Broberg & Sarjala, 2015; Helbich et al., 2016; Hollein et al., 2017). Strictly separated cycling paths from the pedestrians are described important by findings of Pucher & Buehler (2008) yet similar findings have not been discussed in studies about children.

Household

Low percentage of chauffeuring to school was a surprising finding in this research. The share is believed to be higher by experts and was also reported higher in an earlier study (Eesti Uuringukeskus, 2017). However, congestion in front of schools in the mornings could also be caused by parents of younger children. This would be in line with Carver et al (2013) who found that primary school children are more likely to be chauffeured. Such explanation is consistent with studies indicating that young adolescents are more likely to travel independently (Helbich, 2017; Mitra, 2013; Mitra & Buliung, 2015). Estonia's limited policies regarding car use may also lead to more parents driving children to school. This is in keeping with the findings of Deka (2013) and Helbich (2016), who state that policies aimed to reduce car use will have an influence on car chauffeuring in school transportation.

As children in Tallinn primarily have mountain bikes, parents may not allow their children to take this bike to school. This is related to the low safety measures of school's parking facilities. Such findings have not been discussed in earlier studies.

The child

Children who cycle are primarily younger school children, as found through the observations. This is consistent with findings of Potoglou & Arslangulova (2017), who add that active travel to school peaked at age 12 and decreases from there. Considering that increasing age of children is related to improved cognitive abilities and independence (Carver et al., 2013; Mitra & Buliung, 2015), more active travel could be expected among adolescents. However, as taking the public transport is free for school-going children and most of their peers take the public transport, opting for this mode is understandable.

The choice for public transport is also reported as a comfortable option for the youth (Hollein et al., 2017). In a qualitative study in New Zealand (Hinckson, 2016), the adolescence found taking the bus a convenient, cool and fun option that allows them to hang out with friends. Thus, as discussed in the focus groups, mode choice is influenced by friends' opinion on mode choice and their actual mode choice. Additionally, at the age of 13-16, the children have formulated their own opinion about different mode choices (Johansson et al., 2012; Mitra, 2013; Mitra & Buliung, 2015), which corresponds to the results of this study. For instance, adolescence in Stockholm said that they would avoid cycling in traffic if possible (Johansson et al., 2012).

7 Conclusions and Recommendations

Physical activity among children has rapidly decreased in the past decades as children perform more sedentary activities and are often driven to school. Enabling active school travel would introduce some extent of physical activity back into children's lives. Among active travel modes, cycling allows commute on longer distances than walking and is thus a suitable alternative to motorized daily travel in a city.

Tallinn adopted its first cycling strategy in 2018 and is gradually retrofitting the city for cycling. Among other aims, the strategy aims to develop safe cycling infrastructure around schools to enable cycling to school. In

collaboration with the Tallinn Cycling Coordinator, this research identified key factors that influence cycling to school in Tallinn.

The key factors that influence cycling to school in Tallinn are safety on school travel routes, parking facilities both at home and schools, and the availability safe, smooth, connected and separated cycling infrastructure. The Tallinn Cycling Strategy already provides a variety of measures that can improve safety of cycling in the city which will be implemented step-by-step.

Additionally, in order to increase safety on school routes, the city should take a comprehensive approach which would allow both infrastructure improvements in collaboration with children and parents, but also include campaigns that influence travel behaviour. As parking facilities are currently a major constraint to cycling in the city, the city could provide parking guidelines that help dwelling owners and schools to choose for a parking facility that is convenient and safe.

This research sheds light on a capital city in Europe that is taking its first steps to allow for more cycling. The findings here support the understanding that simple adoption of measures from a city such as Amsterdam would not result in the desired benefits because of the lack of a cycling culture. Instead, upcoming cycling cities should focus on measures that the inhabitants deem important. Additionally, upcoming cycling cities can learn from each other and avoid implementing infrastructure measures that other cities are now starting to correct, such as lack of separation between cyclists and pedestrians.

8 Limitations

The extent and quality of the survey and the focus group sessions in this research has to be considered carefully due to financial and time constraints posed for this research.

First, the survey had to be short and concise, which lead to a 10-minute time frame and the use of the KahootTM. This tool only allowed multiple-choice questions, which left no room for children's personal views if they differed from the given answers.

Second, the focus group sessions were held with less participants than originally planned. The parents' session only included three parents of which two are active cyclists themselves. Although the parents seemed to be able to offer a broad view on cycling to school, conversation with a larger group of parents could have offered more insights into the opinion of parents who are less likely to allow their children to cycle. The children's focus group was limited to participants who participate in cycling training, thus eliminating pupils who, for example, feel uncomfortable when cycling.

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