ELEMENTARY SCHOOL CHILDREN'S INDEPENDENT MOBILITY IN TOYOHASHI CITY

Toyohashi University of Technology, Student Member, Sri Sharmin Baskaran
Toyohashi University of Technology, JSCE Member, Kojiro Matsuo
National Institute of Technology, Kagawa College, Kosuke Miyazaki
Toyohashi University of Technology, JSCE Member, Nao Sugiki

1. Introduction

The term 'children's independent mobility' or CIM was introduced by Hilman et al.[1] and is defined as the opportunity for children to move freely in the neighborhood without an accompanying adult. In Japan, most elementary schools allow children to walk to and from school on their own, and even outside of school, children are encouraged to move independently from a young age. A research study conducted by the University of Westminster[2] in the United Kingdom since 1971 shows that the opportunity for children to go out without being accompanied by parents is decreasing in England, with the percentage of children allowed to go to school without adult supervision dropping from 80% to 9% within 20 years, which is worrisome as it has been suggested that walking and cycling has positive effects on mental health and general well-being.

The main purpose of this study is to investigate the mobility of elementary school children in Toyohashi city in terms of children's travel habits to school, their walking and cycling patterns as well as their usage of public transportation habits outside of travel to and from school, to provide initial insights regarding the extent to which elementary school children in Toyohashi city are allowed to engage in CIM based on the results of questionnaire survey conducted. This study also investigates the possible factors that may cause an effect on CIM in Toyohashi city.

2. Methodology

A web-based questionnaire survey was conducted at Asahi Elementary School and Iwata Elementary School to understand CIM of elementary school children in Toyohashi city better. The reason these two schools were chosen is due to the accessibility to the usage of tram as the ability to use tram can be considered as one of the special features of Toyohashi city. The total respondents from both schools were 533 parents or guardians (240 with boys, 293 with girls) with the response ratio being 52%.

The questionnaire was divided into 7 main sections: basic attributes, children's travel habits to school, children's walking habits outside of travel to school, children's cycling habits outside of travel to school, children's public transportation usage habits outside of travel to school, attributes of guardian of children and opinion on children's mobility in Toyohashi city. There is a request for parents or guardians to answer the questionnaire survey while assuming there are not any restrictions in movement or travel because of coronavirus.

3. Results

a. Range of Distance Allowed for Children to Walk and Cycle Alone

Fig. 1 shows the results for parents or guardians' opinion on range of distance allowed for children to walk alone outside of travel to school. Based on the results, elementary school children are likely to be allowed to walk alone further in distance as their age increases. As the elementary school grade increases, children are more likely to be allowed to walk alone within their school district and the tendency for them to be allowed to travel to next school district increases too. Most guardians allow children from Grade 2-5 to walk up to the range of 2km, while Grade 6 children are allowed to walk alone up to 3km. Similar results were obtained for children cycling alone.

Fig. 1 Opinion on range of distance allowed for children to walk alone

b. Frequency of Children Walking/Cycling Alone

Fig.2 shows the results for frequency of children going out by walking alone. While the results indicate that it is not very frequent for children to walk alone, the frequency increases as their school grade increases. Hence, it can be said that school grade of elementary school children has a positive association with CIM of walking alone. Similar results were obtained for children cycling alone.

Fig. 2 Frequency of children going out by walking alone

c. Usage of Public Transportation

Fig.3 shows the results for opinion of parents and guardians on type of public transportation allowed for children to use alone. We can see that in Toyohashi city, among all the modes of public transportation available, guardians are most likely to allow their children to use tram alone, while less likely to allow the usage of bus and train alone. This is an interesting finding as tram is a mode of public transportation that is not available nationwide in Japan with the accessibility to tram being considered as a special feature, as Toyohashi city is one of the only 17 cities across Japan that still uses trams. Meanwhile, the lack of access to train stations from target elementary schools might be the reason behind less usage of train. Furthermore, as school grade increases, children are more likely to be allowed to use public transportation alone. Overall, it can be said that CIM for public
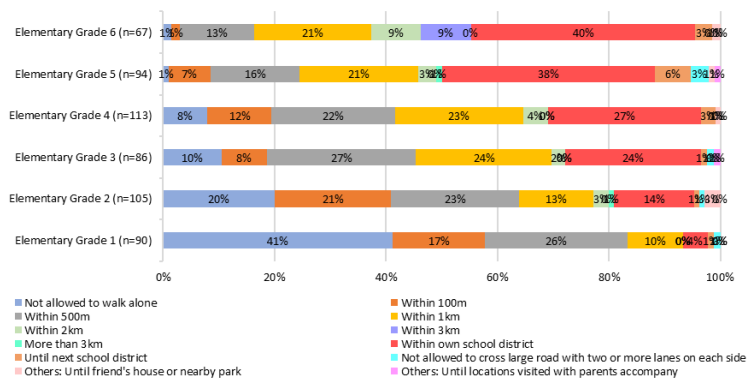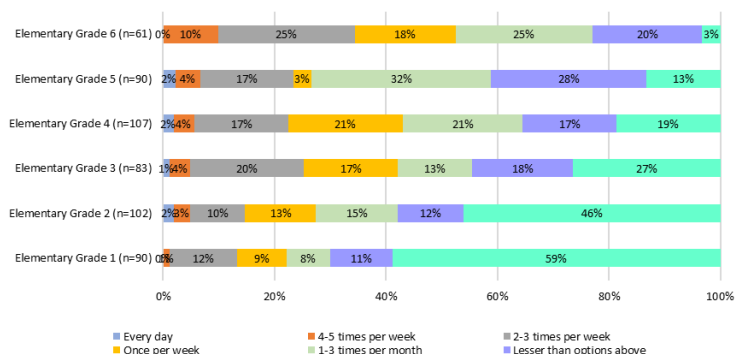
transportation usage increases as school grade increases, especially for usage of tram once they enroll in Grade 6.

d. Statistical Model Analysis on Range of Distance Allowed for Walking and Cycling

Table 1 shows the results of multiple linear regression analysis when the range of distance allowed for walking alone was regressed on the target elementary school, gender of children, school grades, opinion of parents and guardians on watch over by people around, and opinion on traffic safety. The p-value for independent variables: gender of children, elementary school grade dummies, and opinion on traffic safety is less than 0.1, which shows that these independent variables have a significant relationship with the dependent variable: range of distance allowed to walk alone. The results suggest that older elementary school children have higher CIM to walk alone, especially with an increase of 210 meters allowed between children in Grade 4 and 5 and increase of 340 meters allowed between children in Grade 5 and 6. Similar independent variables showed positive association with range of distance allowed to cycle alone.

e. Statistical Model Analysis on Probability of Using Tram Alone

Table 2 shows the results of logistic regression analysis to identify the probability of tram being allowed to use alone for elementary school children. Probability of tram being allowed to use alone was regressed on the target elementary school, gender of children, school grades, opinion of parents and guardians on watch over by people around, opinion on traffic safety, frequency of guardians' usage of tram, frequency of children using tram together with guardians, and awareness on the name of nearest tram station Similar to the results to when multiple regression analysis on range of distance allowed for walking and cycling alone, the independent variables: gender of children, elementary school grade, and opinion on traffic safety affect the probability of parents and guardians allowing their children to use tram alone. Boys, children in higher school grade and lower level of worry on traffic safety contribute to higher level of CIM in terms of using tram alone. Besides that, target elementary school, opinion on watch over by people around, frequency of children using tram together with guardian, and awareness on the name of nearest tram station variables too have positive association with the probability of children using tram alone. Children in Asahi Elementary School, with higher level of opinion on watch over by people around and higher frequency of using tram together with guardian, along with parents who are aware of the nearest tram station have higher levels of CIM to use tram alone outside of travel to school. This may be supported by the closer distance of tram station to Asahi Elementary School than Iwata Elementary School and parents' opinion of feeling comfortable to allow their children to go to places where they are familiar with and have been together with parents accompany before.
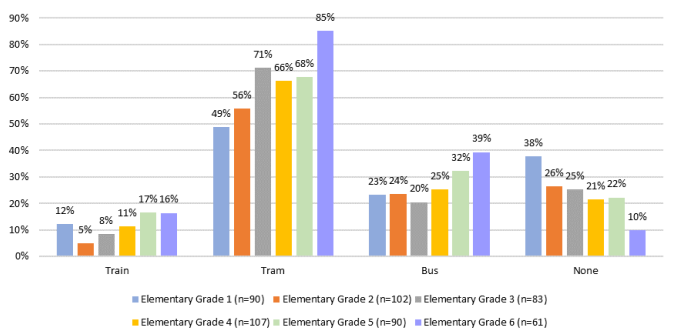

Fig. 3 Opinion on type of public transportation safe for children to use

Table 1 Results for multiple linear regression analysis on range of distance allowed for walking alone (adjusted R^2=0.19)

	Coefficients	Standard Error	p-value	Lower 95%	Upper 95%
Constant	-0.013	0.11	0.91	-0.23	0.21
Elementary School (Asahi ES=1)	<0.01	0.072	0.99	-0.14	0.14
Gender (Boys=1)	0.11	0.056	0.052	<0.01	0.22
Elementary Grade 2 Dummy	0.14	0.085	0.095	-0.025	0.31
Elementary Grade 3 Dummy	0.31	0.093	<0.01	0.13	0.49
Elementary Grade 4 Dummy	0.32	0.088	<0.01	0.15	0.49
Elementary Grade 5 Dummy	0.53	0.10	<0.01	0.33	0.73
Elementary Grade 6 Dummy	0.87	0.11	<0.01	0.65	1.10
Watch Over by People Around	0.013	0.046	0.78	-0.078	0.10
Traffic Safety	0.13	0.044	<0.01	0.047	0.22

Table 2 Results for logistic regression analysis on probability of allowing children to use tram alone (adjusted ρ^2=0.15)

	Coefficients	Standard Error	p-value	Lower 95%	Upper 95%
Constant	-2.32	0.44	<0.01	-3.18	-1.46
Elementary School (Asahi ES=1)	0.47	0.26	0.073	-0.044	0.98
Gender (Boys=1)	0.36	0.20	0.074	-0.035	0.75
Elementary Grade 2 Dummy	0.28	0.31	0.36	-0.32	0.89
Elementary Grade 3 Dummy	0.99	0.34	<0.01	0.32	1.65
Elementary Grade 4 Dummy	0.68	0.31	0.030	0.064	1.29
Elementary Grade 5 Dummy	0.68	0.33	0.040	0.031	1.33
Elementary Grade 6 Dummy	1.84	0.44	<0.01	0.97	2.70
Watch Over by People Around	0.30	0.16	0.065	-0.018	0.63
Traffic Safety	0.53	0.15	<0.01	0.24	0.82
Frequency of guardians' usage of tram (More than once per month=1)	-0.26	0.40	0.52	-1.05	0.53
Frequency of children using tram together with guardians (More than once per month= 1)	1.19	0.65	0.067	-0.084	2.46
Awareness on name of nearest public transportation station (Tram station= 1)	0.71	0.21	<0.01	0.30	1.12

4. Conclusion

Overall, it has been discovered that school grade, gender, along with traffic and crime safety are positively associated with CIM for walking, cycling, and using public transportation alone. Beside those variables, closeness and frequency of children using public transportation with guardian and opinion on watch over by people around has influence on CIM of being allowed to use public transportation alone outside of travel to school. Further research should be carried out to determine if there are other factors that affect CIM of elementary school children as this study was limited to schools in city area and nearby to tram station.

REFERENCE
1) Mayer Hilman, John Whitelegg, John Adams, One False Move … A Study of Children's Independent Mobility, London: Policy Studies Institute, 1990.
2) Ben Shaw, Ben Fagan-Watson, Björn Frauendienst, Andreas Redecker, Tim Jones, Mayer Hilman, Children's independent mobility: a comparative study in England and Germany (1971-2010), London: Policy Studies Institute, 2013.

ACKNOWLEDGEMENT