Spatial Behavior of Children’s Independent Mobility in Depok, West Java, Indonesia

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Abstract. Distribution of elementary schools in Depok, West Java, is not only located in settlement area. This situation influences the pattern of children’s independent mobility, which is one of the aspects in Depok’s Children Friendly City program. This research aimed to discover the spatial behaviour pattern of children’s independent mobility in Depok. Sample in this research consists of 7 elementary schools and the data was gathered by 4th graders’ questionnaire filling, narration writing, and mental map drawing. Furthermore, the data was analyzed using spatial analysis method. The result showed that there is correlation between human activities around the school and children’s chosen transportation mode. Moreover, trip distance also affects the type of transportation mode. The further children’s trip distance, the more limited transportation mode they can use. From the analysis result, it is concluded that school location influences the spatial pattern of children independent movement. The fact that schools are placed in high-crowd area shows that Depok hasn’t taken side yet with children’s independence in doing trip to school as the aspect of Children Friendly City program.

1. Introduction

Children friendly environment can be defined as a complex multidimensional and multilevel concept based on environment settings and structure which provides support for children as individual and group, so then children can build and implement their aims and plan [1]. However, in history, city’s planning and development tends to take side with productivity and sets children’s and elderlies’ needs aside, while low safety level and living environment quality may decrease children’s potential to develop [2, 3, 4]. This is unfortunate because according to UNICEF in 2002, half of children in the world live in urban area, mostly in medium income countries in Afrika, Asia, and South America [5].

Cities with unfriendly environment for children could increase children crime in the area; a research in Cali, Kolombia, showed that the absence of park, recreation space, and opportunity in society turned street into children’s play and interaction place, which was together with street gang members [6, 7]. Those children-related problems in cities are linked with idea of children friendly city. The idea of children friendly city by UNICEF appeared for the first time as the part of United Nation Conference on Human Settlements (Habitat II) in 1996, according to United Nation Declaration of Children’s Rights in 1989. This concept can be applied evenly by government from various communities that involves children [8].

Children friendly city initiation is also being applied in cities in the world. Cities in Italia has actively involved children in planning and decision making. Rosario, in Argentina, created “Rosario: City of Children” in 1996, where children can participate in designing city for public project as Children Advisory Council or “Planner Children”. In Beirut, one of the successful programs is Road Safety Initiative in 2001 to prevent serious injuries caused by accident and to increase safety in Beirut [7, 9, 10]. In Indonesia, children friendly city implementation is under the authority of Ministry of Women Empowerment and Child Protection Republic of Indonesia.

Children friendly city becomes main program of Depok city government. One of the indicators is the safety of children’s independent mobility. However, some researches in Indonesia showed that children’s, parents’, and teacher’s understanding about school safety zone (ZoSS) were still low [11, 12,
Moreover, availability of ZoSS and other supporting facilities, including sidewalks, is not evenly distributed in all schools in Depok. In 2015, according to traffic accident data from POLRES Depok, there were 280 occurrences in Depok and 70 of them were double accidents, which involved both vehicle and pedestrian, and 15% of the victims were students. The data shows the very low safety level of pedestrians, including children who move independently in the city.

This research was focused on elementary school children who do independent mobility, because, at this age (6-12 years old), children are already in concrete operational phase, which means they understand spatial relation well, have clearer idea about distance and travel duration, and are able to remember route and street signs easily [14]. Still, at this age, children need safety support in doing independent mobility. Therefore, this research was done to know the spatial behavior pattern of children independent mobility in Depok.

2. Area of Study and Data

Depok, which is located in West Java Province on the south of capital city region, with other cities in Jabodetabek metropolitan area, supports DKI Jakarta as its buffer city. The landscape from south to north is lowland, with around 200.29 km² area, elevation between 50-140 meters above sea level, slope less than 15%, and high population density (10,621 person/km² in 2015). Strategic location between DKI Jakarta Province and Bogor makes Depok develops fast, accompanied by the development of regionally synchronized transportation network with other cities.

This research was done with qualitative method, in which the data gathering involved children directly by drawing mental map and telling their daily trip through narration. Besides, this research also used secondary data from government institution. Here is the list of datasets of this research:

| Aims                              | Data                                           | Data Source     |
|-----------------------------------|------------------------------------------------|-----------------|
| Accident level according to street| Data of Depok traffic accident in 2015          | POLRES Depok    |
| Spatial behavior of children’s mobility | • Distance range  
• Mode and track choice | Mental map dan narration |

Figure 1. Administrative map of Depok city
3. Methodology

According to data from Depok Education Authorities in 2012/2013, there are 423 elementary schools in Depok area, which consist of both public and private schools. In this research, 7 schools in 4 different locations were chosen as location sample for data collection by purposive sampling method (shown in Figure 2) with criterias:

- Public schools which have at least 20 students in one class,
- Located on the road that became traffic accident location in 2015 according to data from POLRES Depok,
- Located on arterial or collector road with public transport route, and
- There is trading activity or service located in range 0-500 meter.

Mental map or cognitive map describe as something that can appear in form of mobilization planning which is remembered by someone when they give direction to friends, or can be a representative of someone’s mapping from his behavior towards places [15]. Cognitive map is a mental representative that is built by someone about the world around them, a combination of accepted continous information flow, and is built from time to time from their experience [16]. Therefore, through the mental map that is drawn by children, we get to know not only their daily route but also environmental aspects during the trip which they find interesting.
Mental map that we collected as primary data is also strengthened by short narration that was written by children to tell their daily trip experience. At the end, mental map is processed to be the map of children independent mobility spatial behavior and used as analysis material along with the written narration.

4. Result and Discussion

4.1. Children’s Independent Mobility

Children independent mobility can be defined as children’s freedom to mobile around their living environment or their city without adults’ supervision, which is aimed to play or doing trip inside or outside their living place to specific place like school, or anywhere outside the house [17, 18]. Children place themselves and other people inside the space by drawing “quiet” and “not really quiet”. The place that they take as their own, which is their own living environment, is being tagged as quiet place, including the aspect when they do mobilization [19].

However, children’s daily region, places where they mobile independently, has decreased drastically [20]. Even though the accident number weaken, children’s freedom to mobile independently is also getting less because parents assume that the street isn’t safe anymore [21]. Parents’ perception about environment safety plays important role in their decision making to let their children mobile without supervision or not, including their trip for academic activities [22, 23]. On the other side, children limitation in doing independent mobility gives negative impacts, because walking can strengthen their bone, press down heart disease risk, decrease sound pollution and increase social interaction [24].

Through the data collection, it is known that children’s distance range and transportation modes are varied in every location. From 271 respondents, there are 102 who do round-trip independent mobility daily. Table 2 and Table 3 show information of the number of respondents for every classification of distance range and transportation mode.

| Distance range          | Number of respondents (people) | Percentage (%) |
|------------------------|--------------------------------|----------------|
| 0 – 500 meter          | 81                             | 79%            |
| 501 – 1.000 meter      | 9                              | 9%             |
| More than 1.000 meter  | 12                             | 12%            |
| **Total**              | **102**                        | **100%**       |

| Transportation mode    | Number of respondents (people) | Percentage (%) |
|------------------------|--------------------------------|----------------|
| Walking                | 74                             | 73%            |
| Bicycle                | 9                              | 9%             |
| Mass transportation    | 19                             | 19%            |
| **Total**              | **102**                        | **100%**       |

4.2. Spatial Behavior of Children’s Independent Mobility

Spatial behavior discribed as a series of process which is done either conciously or not in human’s life and the result is related with location choice or change [25]. Cognitive is result of decision making process based on individual characteristics, environmental obstacles, situation, and their response towards any policy [26]. There are psychological variable that is involved in interaction between humans and their environment which is resulting in a form of spatial behavior, and is very important in developing appeared behavior as spatial movement and location decision. The variables include behavior, value, emotion, perception and cognition, and learning [25]. Through the data gathering, it was found that children’s independent mobility in all of sample schools reach more than 1000 meter distance.
Figure 3. Maps of spatial behavior of children’s independent mobility in SDN Sukatani 1 and SDN Cinere 1

As the only school located in collector street, compared to other schools, SDN Sukatani 1 have higher percentage of bicycle usage by students (24%), especially for distance between 0-1,000 meters. However, walking still becomes the most popular transportation mode in students’ independent mobility, particularly in range under 500 meters. Besides the narrower street, SDN Sukatani 1 is also surrounded by smaller trading activities. Students mostly pointed out minimarket, Padangnese restaurant, stores, cemetery, and small mosque as landmarks that they remembered from daily trip. This shows that there are not huge human activities which attract and is significant for the students during the trip.

Meanwhile, transportation modes that were used by students in SDN Cinere 1 for independent mobility were only walking, for distance less than 500 meter, and mass transportation for distance more than 500 meter. Different living area grows different experience in students while doing independent mobility. Students who pass Cinere Raya Street everyday live in the distance more than 500 meter and drew bigger activities like supermarket, stores, gas station, and police station, compared to students who live in Masjid Road, a local road near school, with smaller activities like mosque and cake stall being drawn in their mental map. They also have different impression because traffic jam occurs in Cinere Raya Street almost all the time, unlike Masjid Road which is only a local road.
86% students in SDN Cisalak 1 and SDN Cisalak 3 who mobile independently everyday go to school and go back home by walking. Their houses are located in less than 500 meters from the school. Meanwhile, only 1 out of 16 students go to school by bicycle, with distance range less than 500 meters. Compared to other activities around the school, Cisalak Market, which is located across the school and passed by every student everyday, attract most of children’s attention and give biggest impression to the students. Moreover, the market is active not only in the morning but the whole day until evening. Other landmarks that were drawn by students were Al-Islah mosque, goat market, and toll road, all located near the school. Students who do mobility more than 1 km to the south drew industrial activities in Raya Bogor street, such as PT. Meiwa and PT. Tokai.

“...I pass by a bridge and Cisalak Market.”
(BM, boy, 10 years old)

“...interesting stuffs that I see are mosque and market, I see people do trading in the market.”
(SDH, girl, 11 years old)

In SDN Cisalak 4, SDN RRI Cisalak, and SDN RRI Nasional, there is only one out of 23 students who mobile independently uses bicycle as transportation mode. Besides that, 9 students ride mass transportation, in this case Angkot, to go to school and go back home everyday. All their houses are located further than 500 meters from school. That means, more than 50% of them do independent mobility by walking, with less than 500 meters distance range. In terms of landmarks, students who live northern drew different type of landmarks compared to the ones who live in southern of school. Industrial activities, which are factories, were drawn by students from southern area. Meanwhile, students who live in northern area drew public services, such as Sentra Media Hospital and Cimanggis District Police Station, the most.

Located in Raya Bogor Street, which is an arterial street with many kinds of activity, including trading and industrial ones, becomes the reason why the usage of bicycle is very low in SDN Cisalak 1,
SDN Cisalak 3, SDN Cisalak 4, SDN RRI Cisalak, and SDN RRI Nasional. The street is not only crowded by private cars, motorbikes, mass transportation, including buses, but also by trucks that used for distribution needs. For SDN Cisalak 1 and SDN Cisalak 3 case, Cisalak Market across the school which is active the whole day and influences traffic in surrounding has the biggest impact. Meanwhile, in other three schools, industrial activity affects the most. With this traffic condition, along with the intense human activity, there are less parents who give permission to their children to mobile independently riding their own vehicle, compared to school located in friendlier environment like SDN Sukatani 1. Environment characteristics of those 5 schools appeared not only in field observation but also through students’ explanation in narration they wrote.

“...and when I go home, I see bus on the street. After I move my thumbs, the bus horns ‘telolet’.”
(MRS, boy, 9 years old)

“...I arrive at school at 11:35 WIB. I saw a very big bus.”
(AN, boy, 11 years old)

“...I saw a very big bus and motorbike and private cars on my way to school.”
(JM, girl, 10 years old)

Figure 5. Raya Bogor street is crowded with vehicles, including the big ones.

4.3. Pattern of Spatial Behaviour of Children’s Independent Mobility
According to those findings, we can say that spatial characteristics of school which becomes both the trip generation and trip attraction affect the spatial behavior pattern of children’s independent mobility. Human activities, traffic and vehicle flow, road width, and mass transportation availability are all able to influence the pattern. Figure 6 shows how the spatial behavior pattern is formed based on distance range by each influencing location characteristic.
Figure 6. Scheme of spatial behavior of children’s independent mobility in Depok.

- Region I has the most vary transportation modes, which include walking, bicycle, and mass transportation. Children’s ability to move independently and transportation choice in less than 500 meters from school are influenced by human activity around school, road class, and availability of transportation facilities, both vehicle and pedestrian road.

- In Region II, transportation modes are limited to bicycle and mass transportation because distance between 501 – 1.000 meter is too far for children to reach by foot. Unlike Region I, elements which affect the spatial behavior of children independent mobility are road class and availability of mass transportation track.

- Transportation modes which are used by students in Region III are limited to mass transportation. Riding bicycle might be too dangerous to reach more than 1.000-meter distance and too far for walking. Thus, the only thing that affects student’s ability to mobile independently is available mass transportation track.

5. Conclusion and Recommendation

Children’s distance range and transportation modes choice in their independent mobility are influenced by location characteristics of the school where they study, including human activities around the school, road class, availability of pedestrian facilities, and availability of mass transportation track. Children who study at school with high crowd around tend to have low number of independent mobility. The further distance range and the more crowded human activities around the school, the more limited transportation choice for children to mobile independently.

In terms of implementation of Children Friendly City program, from children’s independent mobility point of view, it can be concluded that Depok cannot be called as children friendly city yet, because the schools are still located in high-tensed area, both in human activity and traffic condition. This is worsened by the unavailability of proper safety facilities for children’s mobility. Walaupun anak-anak merasa senang dan tidak merasa takut dalam melakukan perjalanan mandiri, belum terjaminnya keamanan perjalanan yang dilakukan anak-anak melalui fasilitas yang memadai dan merata membuat Kota Depok saat ini belum pantas untuk mendapatkan predikat sebagai Kota Layak Anak.
References
[1] Haikkola L, Pacilli M G, Horelli L, Prezza M 2007 Interpretations of urban child-friendliness: a comparative study of two neighborhoods in Helsinki and Rome Children, Youth, and Environment 17 319-351.
[2] Biggs S and Carr A 2015 Age and child friendly cities and the promise of intergenerational space Journal of Social Work Practice 29 99-112.
[3] van Vliet W 2011 Intergenerational cities: a framework for policies and programs Journal of Intergenerational Relations 9 348-365.
[4] Aziz N F and Said I 2012 The trends and influential factors of children’s use of outdoor environments: a review Procedia - Social and Behavioral Sciences 38 204-212.
[5] UNICEF 2002 Poverty and exclusion among urban children (Florence: UNICEF Innocenti Research Centre)
[6] Bartlett S 2002 Building better cities with children and youth Environment and Urbanization 14 3-10.
[7] International Institute for Environment and Development 2002 Environment and urbanization brief – 6: building better cities with children and youth Online: http://pubs.iied.org/pdfs/10514IIED.pdf
[8] UNICEF 2004 Building child friendly cities: a framework for action (Florence: UNICEF Innocenti Research Centre).
[9] Varney D and van Vliet W 2005 Local environmental initiatives oriented to children and youth: a review of un-habitat best practices Children, Youth and Environments 15 41-52.
[10] Nour O E H M 2013 building child friendly cities in MENA region International Review of Education 59 489-504.
[11] Jon J A S 2013 Analisis tingkat keselamatan pada zona selamat sekolah di yogyakarta Universitas Atma Jaya Yogyakarta.
[12] Dalono, Sulistio H, Nurhadi I 2012 Kajian program aksi keselamatan transportasi jalan: kasus zona selamat sekolah (ZOSS) dan potensi penerapan lajur sepeda motor di kota Malang Rekayasa Sipil 6.
[13] Kusmaryono I, Rusgiyarto F, Widjajanti E 2010 Persepsi pengguna fasilitas zona selamat sekolah Jurnal Transportasi 10.
[14] Papalia D E, Olds S W, Feldman R D 2008 Human development (psikologi perkembangan) (Jakarta: Kencana Prenada Media Group).
[15] Tuan Y F 1975 Images and mental maps Annals of the Association of American Geographers 65 205-213.
[16] Al-Zoabi A 2002 Children’s ‘mental maps’ and neighborhood design of Abu Nuseir, Jordan, Children and the City (Shawal, Amman, Jordan).
[17] Tranter P and Whitelegg J 1994 Children's travel behaviours in Canberra: car-dependent lifestyles in a low-density city Journal of Transport Geography 2 265-273.
[18] Shaw B, Watson B, Frauendorf B, Redecker A, Jones T, Hillman M 2013 Children’s independent mobility: a comparative study in England and Germany (1971-2010) (London: Policy Studies Institute).
[19] van der Burgt D 2008 How children place themselves and others in local space Geographies of Children and Youth 90 257-269.
[20] Karsten L and van Vliet W 2006 Children in the city: reclaiming the street Children, Youth and Environments 16 151-167.
[21] Hillman M & Adams J G U 1992 Children’s freedom and safety Children’s Environments 9 10-22.
[22] Shokoohi R, Hanif N R, Dali M M 2012 Children walking to and from school in Tehran: associations with neighbourhood, parental concerns and children’s perceptions Procedia -
Social and Behavioral Sciences 38 315-323.

[23] Ben-Arieh A, McDonell J, Attar-Schwartz S 2009 Safety and home-school relations as indicators of children well being: whose perspective counts? Social Indicators Research 90 339-349.

[24] Gielen A C, DeFrancesco S, Bishai D, Mahoney P, Ho S, Guyer B 2004 children pedestrians: the role of parental beliefs and practices in promoting safe walking in urban neighborhood Journal of Urban Health: Bulletin of the New York Academy of Medicine 81 545-555.

[25] Golledge R and Stimson R J 1997 Spatial behavior: a geographic perspective (New York: Guilford Press).

[26] Xie R and Shibasaki R 2001 Conceptual framework of human spatial behavior simulation based on HLA (22nd Asian Conference on Remote Sensing).