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28th Presentation Session for Traffic Accident Investigations, Analysis, and Research

Analysis of Traffic Accidents Involving Children

—A focus on interactions between small children and their guardians when walking or bicycling, and on elementary school students when returning from school—

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1. Introduction

1-1. Background of Research

Despite the decrease in accidents involving the death or injury of children in recent years, traffic accidents involving the death or injury of multiple children while walking or riding bicycles are almost covered by the media. In an aging society with a declining birthrate, traffic safety for children is an issue just as important as traffic safety for the elderly. This makes it essential that traffic accidents, which serve as the basis of countermeasures, be analyzed to reduce the levels of harm they pose to the children responsible for the future of our society. However, in reality, attention is only paid to numbers of casualties suffered by child pedestrians around 7 years of age during the start of the school year, with little other detailed analysis being seen. To make child traffic safety more practical and effective, the characteristics of the latest traffic accident data must be analyzed and presented.

1-2. Purpose and Method of Research

This research aims to identify the characteristics of traffic accidents resulting in child casualties in order to help reduce the numbers of such accidents. Although the characteristics of accidents are diverse, this paper presents the results of aggregating and analyzing traffic-accident statistical data (macro data) with a focus on the following points and considering changes in traffic participation patterns (traffic modes).

- Walking by children under 6, with a focus on their interactions with guardians
- Bicycle riding, with a focus on riding with a passenger versus riding alone
- When children around 7 years of age are walking, with a focus on situations such as returning home from school

We will also identify the characteristics of accidents involving child casualties using traffic accident investigation data (micro data).

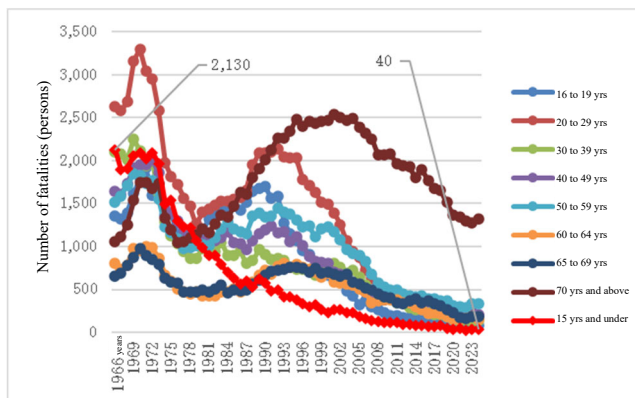


Figure 1. Trends in numbers of fatalities by age group (1966 to 2024)

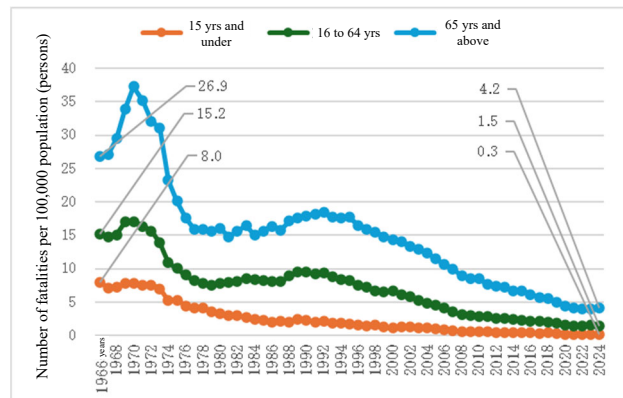


Figure 2. Trends in numbers of fatalities per 100,000 population by age group (1966-2024) (population cited from documents from the Statistics Bureau, Ministry of Internal Affairs and Communications)

2. Trends in Numbers of Child Traffic Fatalities and Casualties

Published since the late 1960s, numbers of child fatalities (total for children aged 15 and under) have decreased significantly from 2,130 in 1966 to 40 in 2024 (Figure 1). Similarly, the number of fatalities per 100,000 population has also decreased from 8.0 to 0.3, representing an approximately 1/30th decrease and much larger than the roughly 1/6th decrease (26.9 to 4.2) seen among the elderly (Figure 2). Although the number of child casualties per 100,000 population aged 12 and under is also on a decreasing trend, 7-year-olds had the highest levels of casualties from 1993 to 2020, but have been surpassed by 8- and 12-year-olds in recent years (Figure 3). Thus, an overall decrease in child fatalities and casualties can be observed.

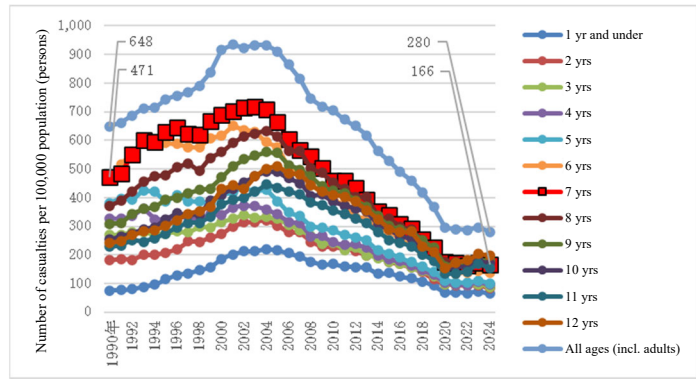


Figure 3. Trends in numbers of child (up to 12 years old) casualties per 100,000 population by age (1990–2024) (for ages 1 and under, ages 0 and 1 are combined; same applies below)

3. Analytical Perspective: Child Growth and Transitions in Traffic Participation Modes (Traffic Modes)

In this research, we focus on transitions in traffic participation modes (traffic modes) depending on child age (growth) (Figure 4). A child’s range of movement expands as they develop, causing their traffic modes to change rapidly. Furthermore, traffic safety in early childhood is thought to be more influenced by the behavior of guardians than by the child’s own voluntary traffic behavior.

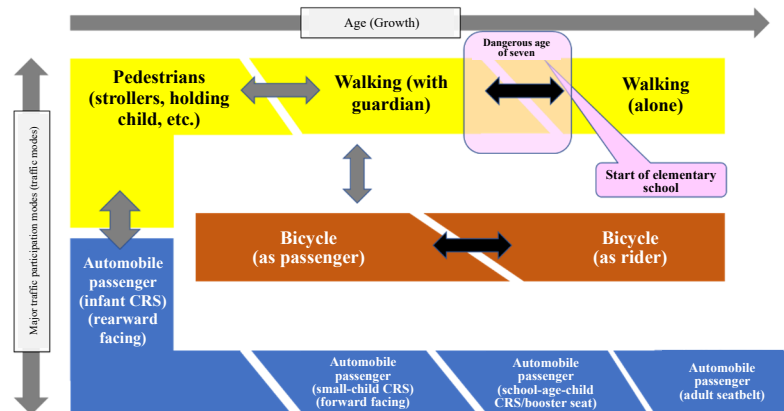


Figure 4. Analytical perspective

Figure 5 shows macro data for numbers and composition ratios of child casualties and fatalities/serious injuries by circumstance at the time of the accident corresponding to traffic mode. (a) Looking at numbers of casualties, a peak can be seen in 7-year-olds while walking, which is often highlighted by the Japanese media when referring to the so-called 'dangerous age of seven'. (b) Fatal injury composition ratios clearly show the rapid changes in traffic mode that occur as children develop, in that the share of casualties while riding in a four-wheeled vehicle is highest among children aged 1 and under and then gradually decreases, the share while walking peaks at age seven, and the share while riding bicycles increases with age. (c) Casualties while walking comprise a larger portion of fatalities and serious injuries than they do overall.

A part of the analysis results is shown below and takes into account the transitions in transportation mode that occur as children grow.

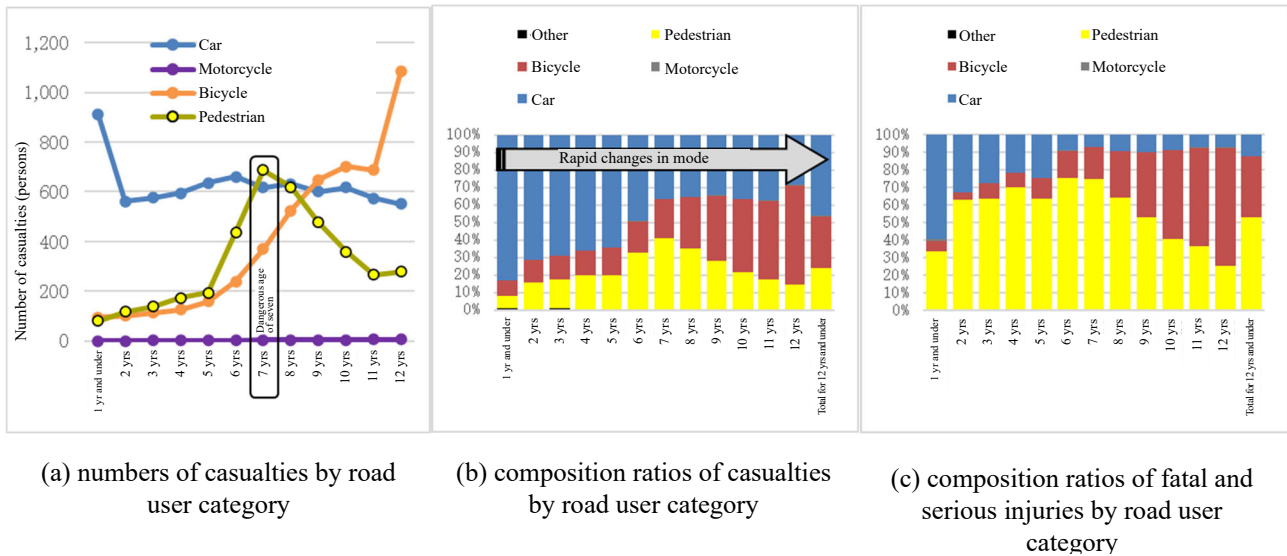


Figure 5. Trends in accidents among children (12 years and under) by age and road user category (averages (a), totals (b, c) for 2020-2024)

4. Analysis of Road Traffic Accident Statistical Data (Macro Data)

4-1. Analysis of interactions between guardians and young children while walking, and of bicycle riding with a passenger versus riding alone

To display trends in collisions between young children and automobiles (including motorcycles), Figure 6 shows composition ratios of human factors for young children fatally injured while walking. The class 'guardian inattentiveness' is added only for children under six and accounts for 63% of those aged 1 and under, decreasing with age to approximately 40% at age 5.

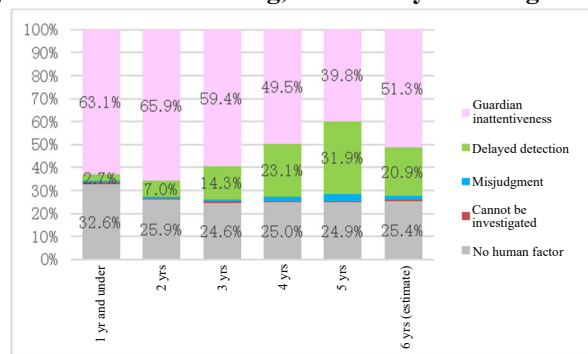


Figure 6. Composition ratios of casualties suffered by children aged 6 and under while walking, by age and human factor (total for primary and secondary parties in pedestrian-automobile accidents, totals for 2010-2019)

Furthermore, to better understand guardian behaviors that impacted child casualty accidents, cases classified as 'guardian inattentiveness' were reclassified from the perspective of guardian-side factors such as 'inattentiveness', 'safety judgment' and 'low safety awareness (allowing to go out alone)', as well as from the perspective of child-side factors such as 'non-cooperation' and similar behaviors. Table 1 shows the results of this reclassification, while Figure 7 shows the numbers of casualties by reclassification category and age. 'Allowing to go out alone', which had been classified as 'low safety awareness' due to the possibility of excessive trust being placed in the child, increased with age possibly due to children being more active or having a wider range of activities. On the other hand, the child behavior 'non-cooperation' decreases from an early age, while the guardian behavior 'carelessness' decreases at a slightly older age because it is mitigated by the child's ability to judge safety, suggesting that factors contributing to accidents involving child casualties reflect both the child's level of development and the corresponding behaviors of children and guardians.

Table 1. Classification of the human factor 'guardian inattentiveness' for young children while walking

Breakdown of the human factor 'guardian inattentiveness'	Reclassification of 'guardian inattentiveness' (unique to this research)				
	Guardian behavior			Child non-cooperation	Don't know
	Safety judgment	Carelessness	Low safety awareness		
Holding hands (children on the road side)	■				
Not holding hands	Thought it was safe	■			
	Dislike holding hands			×	
	Suddenly pulling away			×	
	Distracted when shopping		×		
	Engaged in conversation		×		
	Personal matters		×		
	Unconsciously		×		
	Other				
	Allowing to go out alone			■	
	Unaware of absence				■
Called out carelessly		×			
Other guardian inattentiveness					

Figure 8 shows the analysis results of child bicycle use.

At young ages, child casualties while riding bicycles naturally occur with the child as a passenger, but as they grow, the number of children who suffer casualties while riding a bicycle themselves increases. If the passenger rate is defined as the ratio of 'casualties when riding as a passenger' to the 'total number of casualties while riding with a passenger and riding alone', the rate decreases with age, falling below 50% between ages five and six, at which point riding alone accounts for the majority. Although bicycle education is assumed to be provided upon entering elementary school in Japan, this analysis shows that bicycle use progresses at even younger ages, resulting in casualty accidents. In recent years, toys that can lead to riding a bicycle alone have become common, and it is thought that issues related to young children riding bicycles alone, as well as the need for appropriate traffic-safety education, must be considered.

4-2. Characteristics of accidents involving casualties while walking, mainly among children around age seven in the lower grades of elementary school

According to the analysis of accident times and travel purposes shown in Figures 9 and 10, children aged six and above tend to suffer more casualties while walking to school in the morning and returning home from school in the afternoon than children under age six. The proportion of casualties while returning from school is nearly twice as high as that when going to school. This seems to be influenced by the fact that while various measures have been implemented for when children are walking to school, including accompaniment by guardians, intersection monitoring, and group commuting, these measures are rarely implemented when children are going home from school. This indicates a particular need for countermeasures. Furthermore, the analysis by day and time shown in Figure 11 indicates a significant difference between ages 7 and 8 and the nearby ages of 6 and 9 between 2 and 3 PM and between 4 and 5 PM on weekdays. Although there is an inevitable change in

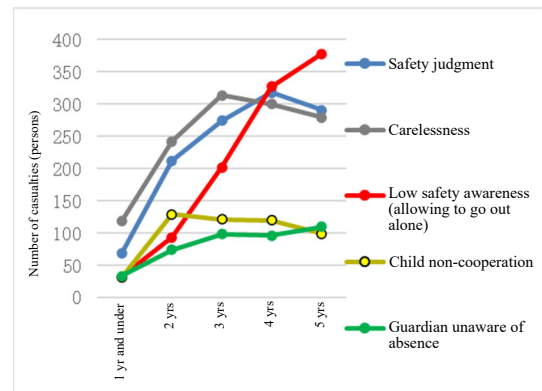


Figure 7. Numbers of casualties by reclassification factor for 'guardian inattentiveness' by age (totals for primary and secondary parties in pedestrian-automobile accidents, totals for 2010-2019)

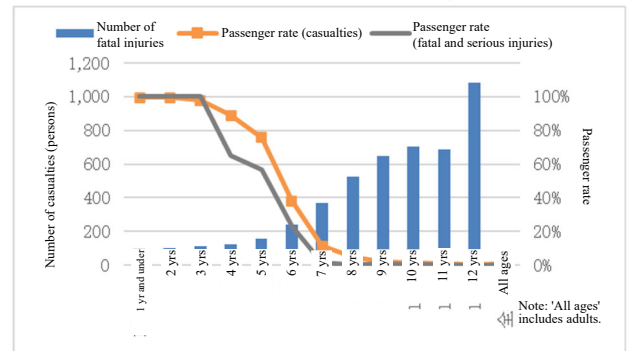


Figure 8. Numbers of casualties and rates of riding with a passenger while riding bicycles, by age (all parties, 2020-2024 averages)

environment and behavior as children move from ages 6 to 7 when they begin attending school, the decrease observed at age nine suggests room for reduction through growth. If the safety level of 7- and 8-year-olds on weekday afternoons could be raised to that of 9-year-olds, a significant reduction in the number of child casualties while walking can be expected. Figure 12 shows the human factors by age, while Figure 13 shows analysis by violation. The main cause of accidents around the age of 7 is 'darting into the road', which accounts for more than 55% of violations. According to the analysis of road shapes and widths at the time of accidents involving children 'darting into the road', as shown in Table 2, the locations where the rate of casualties from darting into the road is particularly higher than the overall rate include: small intersections or their vicinities during travel to school; medium-sized intersections or their vicinities and wide non-intersection roadways during travel home from school; and narrow non-intersection roadways during play. Differences in walking frequency or changes in walking behavior depending on the travel purpose and time of day may have influenced the results.

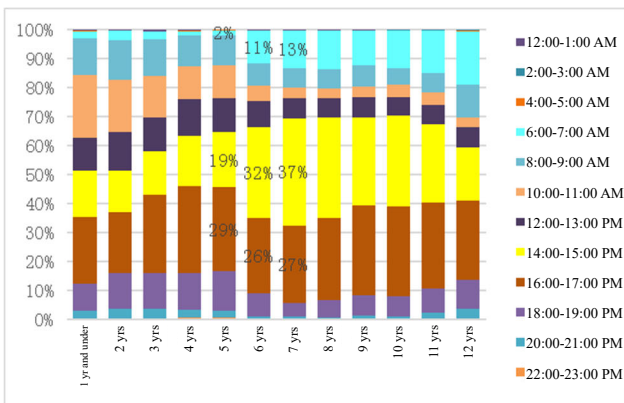


Figure 9. Composition ratios of casualties while walking by age and time of accident (totals for all parties, totals for 2020-2024)

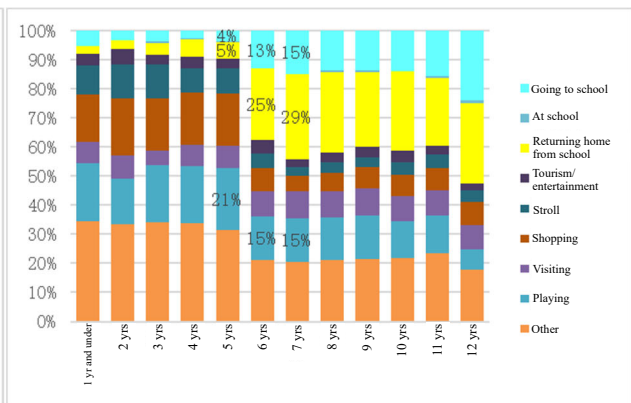


Figure 10. Composition ratios of casualties while walking in pedestrian-to-vehicle accidents by age and travel purpose (totals for primary/secondary parties, totals for 2020-2024)

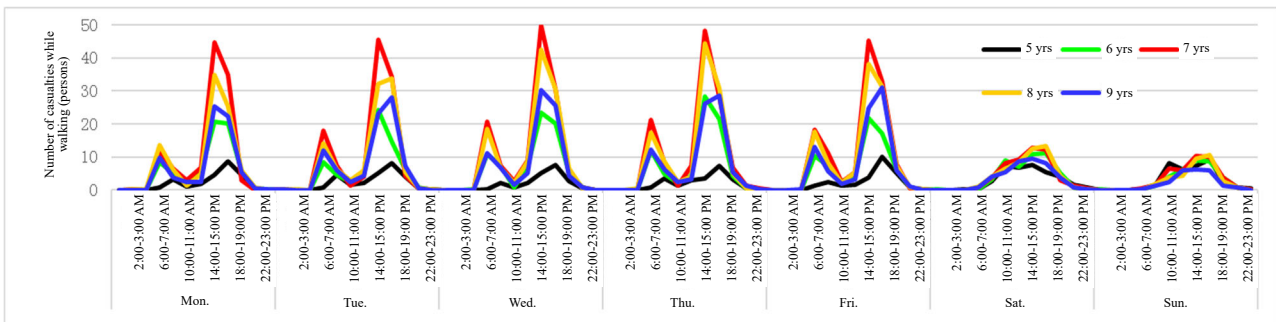


Figure 11. Casualties while walking (5 to 9 years old, all parties, 2020-2024 average) by day of the week (categories are in 2-hour increments, while the scale is in 4-hour increments)

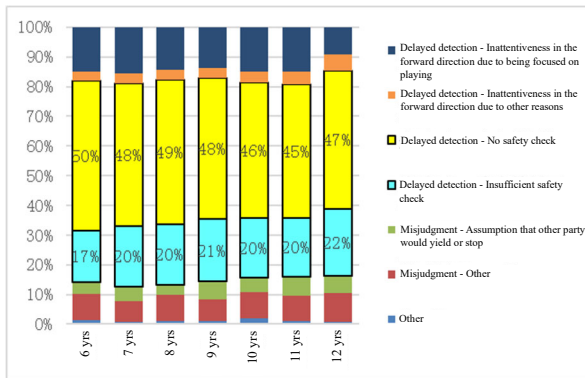


Figure 12. Composition ratios of casualties while walking by age and human factor (All pedestrian-automobile accidents, totals for primary/secondary parties, excluding cases without factors, totals for 2020-2024)

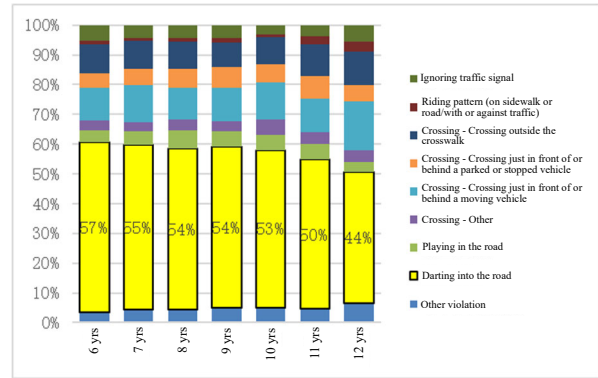


Figure 13. Composition ratios of casualties while walking by age and violation (All pedestrian-automobile accidents, totals for primary/secondary parties, excluding cases without violations, totals for 2020-2024)

Table 2. Numbers and composition ratios of child pedestrians (ages 6 to 8) who darted into the road in pedestrian-automobile accidents, by travel purpose

Road shape	Road width, etc.	Total for all purposes		Going to school		Going home from school		Playing	
		Persons	Composition ratio	Persons	Composition ratio	Persons	Composition ratio	Persons	Composition ratio
Non-intersection	5.5 to 8.9 m	454	23.9%	43	21.3%	98	25.9%	101	20.2%
Non-intersection	3.5 to 5.4 m	379	19.9%	37	18.3%	49	13.0%	141	28.2%
Intersection	Small × Small	350	18.4%	50	24.8%	70	18.5%	100	20.0%
Intersection	Small × Medium	159	8.4%	16	7.9%	37	9.8%	28	5.6%
Intersection	Medium × Medium	127	6.7%	12	5.9%	37	9.8%	24	4.8%
Near intersection	5.5 to 8.9 m	93	4.9%	7	3.5%	25	6.6%	20	4.0%
Non-intersection	Less than 3.5 m	89	4.7%	12	5.9%	10	2.6%	29	5.8%
Intersection	Medium × Small	53	2.8%	6	3.0%	13	3.4%	14	2.8%
Near intersection	3.5 to 5.4 m	51	2.7%	10	5.0%	12	3.2%	9	1.8%
Non-intersection	9.0 m or more	50	2.6%	4	2.0%	16	4.2%	12	2.4%
Total number		1,903	100%	202	100%	378	100%	500	100%

- Aggregation of casualty numbers in pedestrian-automobile accidents involving the walking violation 'darting into the road' (totals for 2020-2024)
 - Aggregation conditions
 - Road width: Four categories with 3.5 m, 5.5 m, and 9.0 m as boundaries
 - Intersection size: Three categories (small, medium, large) for each party with 5.5 m and 13 m as boundaries, for a total of nine categories. The value before the × refers to the pedestrian side, while the value after the × refers to the four-wheeled vehicle side.
 - Traffic signal: Limited to none
 - Pedestrian age: Limited to 6- to 8-year-olds
 - Pedestrian violations: Limited to 'darting into the road'
 - Automobiles: Includes motorcycles
 - Total for primary/secondary parties
 - The table shows the top 10 categories of combined road shapes and with the highest numbers of casualties while walking, broken down by the travel purposes 'Going to school', 'Returning from school' and 'Playing'.
 - Red text in the table indicates categories with composition ratios judged to be particularly higher than the total composition ratio, while blue text indicates those judged to be particularly lower.
- Note: Reliability is decreased if the number of applicable cases is small.

5. Analysis of Accident Cases (Micro Data) Involving Child Pedestrians

5-1. An accident case caused by a child darting into the road

In this weekday-afternoon collision case between a child who darted into a non-intersection roadway and a light passenger car traveling straight ahead, it is assumed that the child attempted to cross to a friend on the opposite side of the road and darted into the road without checking the near-side lane, timing their crossing only

by looking for gaps between groups of vehicles traveling in the opposing lane. The driver of the light passenger car was traveling at about 60 km/h and had noticed the child, but did not anticipate any particular danger. When the child suddenly darted in front of the vehicle, the driver attempted to brake, but a collision occurred. The main factor in this accident was the child darting into the road, which is considered to have resulted from the child focusing excessively on judging gaps between vehicles and failing to perform other necessary safety checks. This is particularly difficult for children due to their limited ability to divide their attention. Furthermore, it is assumed that the child had difficulty predicting the arrival of distant vehicles and did not recognize the need to check the near-side lane. Other factors may include the road being sloped, which can make part of the near-side lane difficult to see for a child of short stature. Key perspectives for preventing casualty accidents include providing guidance based on real accident cases involving children — particularly education on how to safely cross roads without pedestrian crossings — as well as conducting public-awareness efforts for drivers regarding child behavioral characteristics.

5-2. An accident case involving vehicle turning right at a traffic signal intersection and a child crossing

This weekend-morning accident involved a child who began crossing on a green light after waiting at the intersection, and a small truck that turned right from the opposite direction without stopping because the signal changed to green before it had come to a complete stop. Children are known to have a narrower field of vision than adults⁽¹⁾ and without sufficient safety-checking behavior, it is difficult for them to recognize a small truck approaching at a side angle to turn right without stopping. This is because their short stature also makes it difficult to see such vehicles even when they are within their field of vision due to visual obstruction. Such factors are assumed to be child-related factors. Possibly contributing driver factors include focusing on oncoming vehicles and consequently not noticing the child until immediately before the collision; difficulty visually detecting both oncoming vehicles and a child located in a direction different from the driver's point of focus; the child's short stature making them difficult to see due to shadows or obstructions from fences or vehicle pillars; and insufficient safety checks due to the driver being in a hurry. Key perspectives for preventing casualty accidents include providing children with location-specific guidance on safe crossing methods, providing safety guidance based on child developmental characteristics such as their narrower field of vision using real accident cases, and conducting public-awareness efforts for drivers regarding characteristics of child behavior.

6. Challenges Facing Child Traffic Safety

Analysis results show that the following can be considered challenges that must be examined in order to prevent child casualty accidents.

For children not yet in school, behaviors of children and parents that correspond to the child's developmental stage are thought to influence their tendencies to be involved in accidents. Therefore, safety education and public-awareness activities for both parents and children are needed from an early pre-school stage. In particular, a systematic form of traffic-safety education that covers a variety of traffic modes is desirable.

For pedestrians around seven years of age, particular attention must be paid not only to the morning commute to school but also to the afternoon period starting when school ends. One important issue to examine is accident-prevention measures suited to the specific situations children encounter, such as intersections on their way home or straight sections of road while playing. Furthermore, analyses of accident cases remind us that children do not yet have sufficient ability to gather information—such as checking for safety—or to judge danger.

With this in view, we would like to emphasize the need for instruction on how to safely cross roads without pedestrian crossings, for which systematic guidance has been limited compared with instruction at pedestrian crossings.

Traffic-safety education for children requires a multifaceted perspective, particularly in terms of the relationship with parents (Otani, 2025)⁽²⁾, although effective approaches have also been proposed (Nakano et al., 2025)⁽³⁾. Because a child's safety awareness may be related to their safety awareness when using bicycles or automobiles as they grow older (Nakai, 2025; Taniguchi et al., 2025)^(4,5), traffic-safety education for children is especially important. In order to continue contributing to the examination of various measures and related research, future research will focus on traffic modes and relationships with parents.

[References/Sources]

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 - 3 Yukako Nakano et al., 2025, 親子の安全な歩行行動を促す小集団討議を活用した教育的介入の効果検証 [Effectiveness verification of educational intervention using small group discussions to promote safe walking behavior for parents and children] (in Japanese), pp. 62-65
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 5. Yoshio Taniguchi et al., 2025, 自転車と自動車の運転行動に共通する心理要因に関する縦断的研究(3) [A longitudinal study of psychological factors common to bicycle and car driving behavior] (in Japanese), pp. 24-27
- Items 2. to 5. are from the Proceedings of the 90th Annual Conference of the Japanese Association of Traffic Psychology (2025).