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The Current Situation of "Using a Smartphone while Doing Something Else" and Related Factors

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"보행 시 스마트 폰 사용"의 현상과 관련 요인

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Abstract **Purpose**: We will clarify the situation of using a smartphone and what kind of factors are currently related when people use a smartphone while doing something else in order to obtain basic information to educate people to prevent the use of smartphone while doing something else. **Methods**: We conducted an anonymous self-administered questionnaire survey with 885 people who commuted by train to six companies located in Tokyo, Chiba, and Osaka and 550 university students who commuted by train to five universities located in the same areas. The research period was from April to May of 2014. **Results**: 33% of the subjects used a feature phone and 73% of the subjects used a smartphone. 38% of them listened to music, using their smartphones or feature phones while walking. Binominal logistic regression analysis was done with dependent variables of using a smartphone while walking and independent variables of age, sex, and educational advertisement. The results showed that people in their 20s used a smartphone while walking 4.93 times more than people in their 30s($p < 0.00$). No significant difference was found in the relationship between sex and educational advertisement(poster, TV, or magazine) and using a smatphone while doing something else.

Key Words : Smartphone, using a smartphonee while doing something else, Using a smartphone while walking, Using a smartphonee while cycling, Awareness education

요 약 **목적:** 본 연구에서는 보행하면서 스마트 폰을 사용하는 것에 대한 위험을 계몽하기 위한 기초자료를 얻기 위해, 보행 시 스마트 폰 사용 실태와 보행 시 스마트 폰 사용에 있어서 어떠한 위험 요인이 관계하고 있는 지에 대해서 분석하였다. **방법:** 조사대상은 도쿄도, 치바현, 오사카부의 3개 지역의 6개 회사의 전철 통근자 885명과 5개 대학의 전철 통학 학생 550명을 대상으로 조사를 실시하였다. 조사는 무기명 질문지법을 활용하여 조사를 실시했다. 조사 시기는 2014년 4월부터 5월에 걸쳐서 실시하였다. **결과**: 보행 시 스마트 폰을 사용하거나 피쳐 폰을 조작 하고 있는지에 대한 조사 결과는 피쳐 폰 사용 경험자가 33%, 스마트 폰 사용 경험자는 76%를 차지한 것으로 나타났으며, 그 가운데 38%의 조사 대상자는 이어폰으로 음악을 들으면서 동시에 스마트 폰이나 피쳐 폰 조작 경험이 있는 것으로 나타났다. 연령, 성별, 계몽광고 시청 여부 등을 독립 변수로, 보행 시 스마트 폰이나 피쳐 폰 조작 경험의 유무를 종속 변수로 2항 로지스틱 회귀분석을 실시한 결과, 20대 이하의 대상자가 30대 이상에 비해 보행 시 스마트 폰 사용 비율이 4.93배($p < 0.00$) 높은 것으로 나타났다. 성별, 계몽 포스터 시청의 유무, 계몽 텔레비전 시청의 유무, 계몽 홍보 잡지 시청의 유무 등에 대에서는 유의한 차이는 나타나지 않았다.

주제어 : 스마트 폰, 보행 시 사용, 보행 시 스마트 폰, 자전거 타면서 스마트 폰, 계몽교육

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1. Introduction

Cell phones including feature phones and smartphones are commonly used. According to the research done by the Japanese Ministry of Public Management, Home Affairs, Posts, and Telecommunications in 2014, it was clarified that 62% of the research subjects used a smartphone and 42% used a feature phone. Considering the result of research done by the Japanese Ministry of Public Management, Home Affairs, Posts, and Telecommunications in 2012 that 32% owned a smartphone, a smartpone has diffused quickly in a short amount of time. Also in the same research, it was clarified that the percentage of people who owned a smartphone was increased in the age of teens to 40s. Furthermore, according to the research done by the Cabinet Office, Government of Japan in 2013, 97% of high school students owned a feature phone or a smartphone, and more than 80% of them owned a smartphone. Based on the fact, a smartphone is commonly used among people especially in the younger generation.

Since a smartphone allows people to connect to the internet to gather information and interact with friends, it is becoming a device that is close in our life. Recently, various applications have been developed everyday, so it becomes easier to get more information. Moreover, technology that changes the font size of a smartphone according to walking speed was developed[1]. Wireless network providers are developing application to warn people when the phone detects itself to be used while they are moving. It is presumed that its background is that many people use a smartphone while walking or riding a bicycle(hereinafter referred as "using a smartphone while walking)."

When people use a smartphone while walking, they cannot consider what is going on around them because they are concentrating on the screen, so that their walking speed may slow down or they may stop suddenly. It is considered that people's sudden change of walking speed or path when using a smartphone causes them to collide or run into people around them.

What could especially be dangerous is colliding with people with disabilities, senior citizens, toddlers, and pregnant women, who are considered as vulnerable road users. Recognizing people in a wheelchair and toddlers is very hard because they are shorter than others. Therefore, even people not using a smartphone sometimes run into them in a crowded street because they cannot notice them until right before[2,3]. It is suspected that if people use a smartphone while walking, it could delay their notice on people in a wheel chair and toddlers. Also, if a pedestrian collides with a person in a wheelchair, not only the person in a wheel chair is injured, but also the pedestrian gets hurt by the metal piece on the wheelchair such as hurting their Achilles tendon[4]. Furthermore, senior citizens have a lower attention function so they cannot instantly decide how they should act according to the situation they are facing[5, 6]. Therefore, it is thought that they cannot decide which way they should move when they meet a person using a smartphone while walking. In addition, some toddlers have stronger impulse and behave unexpectedly so they may change their course suddenly[7, 8] or it is difficult for people who are using a smartphone while walking to correspond to children's change immediately. For people with visual impairment, they do not even know if there is a person using a smartphone while walking in front of them because they have difficulty getting visual information. In fact, Togashi Tokuda[9] conducted a research with people with visual impairment in 2007, when a smartphone was not widely used. He found out that more than half of the subjects ran into people reading their mails on the feature phone and most of them responded that they ran into pedestrians head-on or close behind them. As it shows, for vulnerable road users, it is difficult to grasp the situation immediately and avoid danger when people using a smartphone while walking slow down or stop suddenly.

The problem was that some people read text messages on the feature phone while walking before a smartphone was developed. Togashi & Tokuda[10] did a research with university students and clarified that more than 70% of them read text messages while walking. Furthermore, Togashi & Tokuda[11] did a fixed point investigation at the concourse of a major station about the walking speed and walking path of people reading text messages while walking. The results verified that people reading text messages while walking had significantly slower walking speed than normal pedestrians and often walked around without any consideration for their surroundings.

There have been accidents involving not only people using a smartphone while walking, but also people being bumped and falling on the railway by them. Many traffic accidents has got involved. Therefore, it is urgent to take measures to prevent people from using a smartphone while walking. So far, the only research on people using a phone while walking was "the Usage of Feature Phones While Walking" done by Tokuda & Tokuda[12] when a smartphone was not developed. Therefore, to acquire the basic materials for educating people to stop using a smartphone while walking, we attempted to find out how people use a smartphone while walking currently and what factors are related with their use of a smartphone while walking.

2. Research Methods

2.1 Research Subjects

The research subjects were 950 people who commuted to 6 companies in Tokyo, Chiba, or Osaka and 720 students who commuted to 5 universities in the same area. We got responses from 898 people and 592 students(89% collection rate). This research was conducted in these areas because they were big cities where there was high possibility of people to use a smartphone while walking and run into others. Also, people and students who commuted by train were selected because this study excluded people using a car who "did not walk" physically. Furthermore, those people worked in retail shops and students attended the departments of child care, nursing, or engineering, so they did not specialize in information or traffic problems. Invalid responses were excluded and finally, a total of 1,435 responses for 885 people and 550 students were analyzed.

2.2 Procedure

We requested to do a research to people who were in charge of the personnel department of company. If they gave consent, we handed them the request sheet and questionnaires, which were distributed to employees. Also, we asked university instructors we knew to cooperate with the research and those agreed distributed the documents to their students. Questionnaires were answered in free writing and collected after the subjects fully completed. The research period was from April to May in 2014.

2.3 Question Items

The question items were 1) attribution, 2) current situation of smartphone usage while walking, and 3) a situation of running into people or almost running into people.

1) Attribution included age, sex, the presence of a smartphone or a feature phone, the presence of commuting by train, frequency of walking in the crowd, frequency of bicycle usage on a daily basis, and how to meet with educational advertisement. The age was selected from "teens, 20s, 30s, 40s, and over 50s". The frequency of walking in the crowd was selected from "often", "sometimes", and "rarely". The frequency of using a bicycle on a daily basis was selected from 4 options, "often", "sometimes", "rarely", and "never". How to meet with educational advertisement was asked whether they have met with advertising about

stop using a smartphone while walking in the poster, on TV, on the radio, or on public relation magazines published by public institutions such as circular notice or city news report.

2) The current situation of using a smartphone while walking was categorized into the frequency of using a smartphone while walking(only answered by people who have a smartphone), the frequency of using a feature phone while walking(only answered by people who have a feature phone), the frequency of listening to music on the earphone using a feature phone or a smartphone while walking, the frequency of using a smartphone while riding a bicycle(only answered by people who have a smartphone), the frequency of using a feature phone while riding a bicycle(only answered by people who have feature phone), and the frequency of listening to music feature phone or smartphone while riding a bicycle. The responses of all questions were selected from 4 options, "very often", "sometimes", "rarely", and "never".

3) For the situation of running into people or almost running into people were asked if they have run into or almost run into people while using a smartphone, if they have run into or almost run into people using a smartphone, the place where they ran into or almost ran into people, and if they got injured when running into those people. For if they have run into or almost run into people while using a smartphone and if they have run into or almost run in to people using a smartphone, responses were selected from 4 options "very often", "sometimes", "rarely", and "never". For the place where they ran into or almost ran into people, responses were selected from "a platform of the railway station", "a ticket gate of the station", "a concourse outside of the ticket gate(excluding platforms)", "stairs", "outside sidewalk", "indoor path", "escalator", and "others". The respondents could choose multiple answers. For if they got injured when running into those people, responses were selected from "severe injury", "minor injury" and "never been injured". Also, the situation of getting injured was answered in free writing.

2.4 Analysis Methods

The ratio and frequency were obtained on 1) attribution, 2) current situation of smartphone usage while walking, and 3) situation of running into people or almost running into people. Also, binary simultaneous logistic regression analysis was done in order to clarify the relationship between using a smartphone while walking and each factor(age group, sex, and educational advertisement). Also, the age group was divided into "teens", "20s, and "30s or over". How to meet with educational advertisement was divided into poster, TV, radio, and public relation magazines published by public institutions.

3. Research Results

3.1 Profile of the Research Subjects

<Table 1> indicates the profile of the research subjects. Their age was teens(24%), 20s(24%), 30s(14%), 40s(23%), and 50s(14%), suggesting wide distribution. Their sex was that 73% was female, suggesting females were more than males. The device owned(multiple responses) was smartphone(87%) and feature phone(18%), suggesting that people owned a smartphone more than a feature phone. Also, 5%(n=83) of people owned both smartphone and feature phone and none of them had neither phone. More than 90% of people responded either "often" or "sometimes" for walking in the crowd. About half of people responded that they "often"or "sometimes" used a bicycle.

The ratio of how to meet with educational advertisement was TV(72%) and poster(55%) but less than 10% of people had never heard or read educational advertisement on the radio or public relation magazines.

<Table 1> The profile of the research subjects (n=1435)

Age	
teens	24% (349)
20s	24% (342)
30s	14% (209)
40s	23% (327)
50s	14% (203)
no answer	1% (5)
Sex	
female	73% (1053)
male	25% (359)
no answer	2% (23)
The device ownd※	
smartphone	87% (1240)
feature phone	18% (262)
The frequency of walking in the crowd	
often	66% (959)
sometimes	25% (357)
not often	8% (114)
no answer	1% (5)
The frequency of using a bicycle	
often	30% (436)
sometimes	18% (258)
not often	17% (251)
not at all	34% (488)
no answer	1% (2)
The ratio of people meeting with educational advertisement ※	
TV	72% (1034)
poster	55% (785)
public relation magazines published by public institutions	9% (127)
radio	6% (86)

3.2 Current Situation of Using a Smartphone While Walking

〈Table 2〉 indicates the results of using a smartphone while walking. Smartphone users answering "very often" and "sometimes"(76%) were more than feature phone users(33%). Also, when we asked if they have used a smartphone and listened to music on earphones while walking, about 40% of them responded "very often" and "sometimes".

<Table 2> Using a smartphone while walking

	smartphone (n=1240)	feature phone (n=262)	earphone+ smartphone or feature phone (n=1435)
very often	30% (376)	3% (9)	13% (193)
sometimes	46% (565)	30% (77)	25% (362)
not often	19% (232)	42% (111)	21% (300)
not at all	5% (67)	25% (65)	41% (580)

<Table 3> indicates the results of using a smartphone or a feature phone while riding on a bicycle. This question were asked to people who answered "often" and "sometimes" for how often they use bicycle on a daily basis. According to the table, 9% of feature phone users and 35% of smartphone users answered "very often" and "sometimes".

<Table 3> Using a smartphone or feature phones while riding on a bicycle

smartphone (n=755)		feature phone (n=113)
very often	9% (68)	2% (2)
sometimes	26% (197)	7% (8)
not often	23% (171)	16% (18)
not at all	42% (319)	75% (113)

3.3 If they have run into or almost run into people

<Table 4> indicates the answer of 'if they have run into or almost run into people when using a smartphone or a feature phone while walking'. None of feature phone users answered "very often" and 3% answered "sometimes" but 2% of smartphone users answered "very often" and 26% answered "sometimes". About 30% of people have run into or almost run into other people. In addition, 15% of people said "very often" and "sometimes" for the question of 'if they have run into or almost run into others when listening to music on earphone using a smartphone or a feature phone while walking.

<Table 4> If they have run into or almost run into people when using a smartphone or feature phone while walking

Smartphone (not using an earphone) (n=1240)		feature phone (not using earphone) (n=262)	earphone+ an smartphone or feature phone (n=1435)
very often	2% (18)	0	1% (11)
sometimes	26% (327)	3% (7)	14% (206)
not often	42% (521)	37% (98)	31% (449)
not at all	30% (374)	60% (157)	54% (769)

<Table 5> indicates the results of the question of 'if they have run into or almost run into people using a smartphone while walking'. As a result, 59% of people answered "very often" and "sometimes" and the rest of the people did not use an earphone when using a smartphone and 53% of people used an earphone "very often" and "sometimes" when using a smartphone or a feature phone.

<Table 5> If they have run into or almost run into people using a smartphone while walking (n=1435)

Smartphone or feature phone (not using an earphone)		earphone+ smartphone or feature phone	
very often	8% (122)	7% (105)	
sometimes	51% (727)	46% (656)	
not often	30% (427)	33% (467)	
not at all	11% (159)	14% (207)	

When we asked the place where they ran into people or almost ran into people, most of them answered "in the station(excluding platform)"(68% which means that 576 people out of 848 ran into or almost ran into people), followed by "sidewalk outside"(66%, 560 people), "platform of a station"(56%, 475 people), and "stairs"(31%, 263 people).

When we asked if they got injured from running into people while using a smartphone while walking, none of them answered "severe injury". Although small, 1%(11 people) answered "minor injury". As for the specific injury, most of them answered "bruise and scrape"(8 people) and some answered "falling off the stairs"or "almost falling down to the railway".

3.4 Relationship between using a smartphone while walking and each factor

<Table 6> indicates the results of binary logistic regression analysis with using a smartphone or a feature phone while walking as one dependent valuable, and age group, sex, and how to meet with educational advertisement as another dependent variable. We divided the age group into 20s and under and 30s and over because the age is the time to have economic independence and marry[13]. It has been often used as an index to show the end of the youth period. The youth life is changed from the late 20s. Many researchers have used 30s as the end of the youth period[14, 15].

<Table 6> Binary logistic regression analysis of using a smartphone or feature phone while walking

OR		95% Confidence interval		Pvalue
		lower	upper	
Age (20s and under VS 30s and over)	4.93	3.36	7.23	0.00**
Sex (male VS female)	0.78	0.60	1.02	0.72
The ratio of people who have seen educational TV (haven't VS have)	0.89	0.68	1.12	0.41
The ratio of people who have seen educational poster (haven't VS have)	0.96	0.75	1.23	0.74
The ratio of people who have seen educational public relation magazine (haven't VS have)	0.74	0.49	1.12	0.16
The ratio of people who have heard educational radio (haven't VS have)	0.57	0.34	0.93	0.03*

** : $p<0.01$
model χ^2 value : 114.26 ($p<0.01$)
discriminant hitting ratio : 71.8%

When we compared people in their 20s and under with people in their 30s, odds ratio was 4.93 times ($p<0.00$) for people in their 20s and under. When we compared people who have heard education advertisement on radio with people who haven't, the odds ratio was 0.57 times ($p<0.05$) , so people who have heard the radio are less likely to use a smartphone while walking. Sex and meeting with educational advertisement on poster, TV, or public relation magazines showed no relationship with using a smartphone while walking.

4. Discussion

4.1 Current situation of smartphone usage while walking and issues

Based on this research, we verified that 76% of

smartphone owners used a smartphone while walking and 35% of them used it while driving a car. Based on the binary logistic regression analysis, people in their 20s or younger used a smartphone while walking more than people who were older. In addition, 38% of them listened to music on their smartphones while walking. If they use a smartphone while walking, it will interfere with acquiring visual information. If they listen to music and use a smartphone at the same time, it will interfere with acquiring both visual and auditory information. In order words, since it is necessary to get auditory and visual information to avoid danger[16], it must be said that listening to music and using a device while walking is extremely dangerous.

This research clarified that more than half of respondents had run into or almost run into people using a smartphone while walking, and about 30% of the respondents had run into or almost run into people when they used a smartphone while walking. Therefore, it is considered that many people are aware of "the danger of running into people if they use a smartphone while walking". Also, since there was no relationship between using TV, posters, or public relation magazines and stopping using a smartphone while walking based on the results of binary logistic regression analysis, it is presumed that people using a smartphone are highly likely to know that they should not use a smartphone while doing something else but they cannot practice it.

No one had serious injury from running into people using a smartphone and many people sometimes run into people using a smartphone. It is considered that people using a smartphone while walking recognize that "people do not run into others very often and it would not cause a big problem even if they run into others."

Based on the previous study, it is important to provide education to change trouble behavior for others and it is necessary to examine the establishment of penalty and environmental improvement[17]. In fact, it was effective to educate people not to park a car on the handicapped parking space[18] and a bicycle on brail blocks[19]. Their change of behavior suggests that the education specifically taught people that how illegal or wrong parking on the handicapped parting space or brail blocks could have harmful effects on people in wheelchairs and people with visual impairment. Also, in the education for preventing illegal use of handicapped parking space, it was effectively conveyed that how people who think that the illegal use of space is not good but "it would be okay if it is a little bit" can give trouble including the element of "threat" people in wheelchairs[20].

Based on these, it is necessary to convey people that when they run into vulnerable road users, what problems and damage they can cause including the element of "threat" in order to change their thought that "this would not become a big problem."

4.2 Limitation of this study and future challenges

In this research, we asked if the subjects have used a smartphone while walking in order to grasp the current situation of smartphone usage while walking, but we could not differentiate if they were still using a smartphone while walking or they are no longer doing it. Since the history of a smartphoe is not very long, it is less likely that there is a large change in the current situation, but the results of this research should be interpreted carefully. In the future, it is necessary to clarify if the subjects still use a smartphone while walking when their experience is asked.

Furthermore, in this research, we asked the age in 5 levels from teens to 50s, but we did not ask whether they were students or working. This was to avoid the respondents being identified because they had different age due to the fact that they were untraditional students. However, we could not made a detailed analysis as a factor of using a smartphone while walking because of that. In addition, it is presumed that

the frequency of smartphone or feature phone usage would influence the frequency of using a smartphone while walking. In the future, it is necessary to clarify that what kind of factor is strongly influencing the smartphone use while walking by including questions that connect to the factor and make sure that respondents cannot be identified.

Also, this research only clarified the current situation of smartphone use while walking. Further researches should quantitatively measure effective educational methods to prevent smartphone use while walking and suggest effective educational contents and methods from the perspective of change in awareness and behavior.

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