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RESIDENTS' EVALUATION OF URBAN ENVIRONMENTS : ATTRACTION OF URBAN LIFE AND ANXIETY ASSOCIATED WITH TRAFFIC ACCIDENTS AND URBAN CRIMES

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The results of questionnaire and interview surveys conducted in Mitaka and Musashino cities are presented for investigating of residents' evaluation of their urban environment, particularly regarding its attractiveness. A special attention was paid to residents' evaluation with regard to anxiety associated with traffic accidents and urban crimes. The urban infrastructure and residents' responses were examined using a Geographic Information System (GIS). Attractiveness associated with the urban environment was classified into two categories: "attractiveness in daily life" and "attractiveness in non-daily life." The residents valued opportunities for relaxing and living in comfort. In non-daily life, the residents specifically valued improved living conditions and harmony between the natural environment and commercial facilities. They attributed crime anxiety to trees, narrow streets, obstructed views, dark areas and a gloomy atmosphere. Residents regarded violent crimes as being prevalent, but considered trespassing and property crimes infrequent. The residents' anxiety about traffic accidents was caused by reckless driving habits, narrow streets, lack of separation between roadway and pedestrians' ways, heavy traffic, and obstructed views. Residents cited main roads and intersections as locations of anxiety, which concurred with frequent accidents.
Key words: geographic information system (GIS); factor analysis; evaluation structure; urban environment; anxiety

INTRODUCTION

Many studies have been undertaken for assessing conventional city environment. They have been carried out by means of classifications using subject attributes and environmental characteristics. In one such study, the caption evaluation method and an evaluation using differences by generations were used to investigate the perceptions of street spaces (Setoguchi et al., 2001). In another study, an attempt was made to clarify the psychological evaluations of streetlights in shopping districts at night (Umino et al., 2001). Nevertheless, both studies did not incorporate detailed information about relevant environmental elements and types of users. Therefore, this paper attempts to investigate various elements of the urban environment to grasp multiple elements comprehensively.

In addition, an investigation of city residents revealed that "environments in which walking and riding bicycles are prevalent and where the dependency on cars is limited" were highly rated (Association of New Urban Housing Technology, 2000). For this reason, the authors used a "living environment in which people want to walk" as a general index for this study.

Further, results of a study by Iwai (2005) have suggested that differences exist between attractiveness in daily life activities and that outside daily life activities. For that reason, attractiveness was

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investigated using categories of daily life and non-daily life in the present study. And feelings of anxiety in a town environment were investigated from a psychological perspective in relation to potential road traffic accidents and crimes.

The following hypotheses were formulated concerning residents' evaluation of their own area of residence.

Attractiveness of urban life: As past studies have shown (Iwai, 2005), regarding attractiveness of an urban area, viewpoints of assessing attractiveness in urban areas are different between those for everyday life activities Åie.g., commuting , attending schoolÅj and those for non-daily, special activities (e.g., leisure, strolling).

Anxiety associated with traffic accidents and urban crimes: Elements causing anxiety about traffic accidents and crimes in an area are inferred when areas with different rates of actual accidents or crimes are compared. In addition, a system for disseminating concrete information related to traffic accidents and crimes to residents is necessary when uneasy feelings induced are different from real situations of traffic accidents and crimes.

The purpose of this study is to establish a methodology for evaluating various elements of the urban environments that are inherent in a city. Therefore, the sense of attraction to towns and residents of housing circumstances are investigated in this study from the viewpoints of both daily and non-daily activities to clarify the evaluation structure. In addition, we intend to clarify the structure of anxiety attributable to potential road traffic accidents and crimes in towns.

METHODS

Local preliminary investigation

As an investigation of towns in which people felt the urge to walk, the acceptability of city street views of the Yanaka-Daikanyama area in Tokyo was investigated (Obata, 2002), in relation to greenery and its relationship to attitudes (Yoshitomi, 2002). A previous 2004 examination by one of the authors of housing circumstances in Nakameguro, Tokyo also focused on that area. For the present study, Musashino and Mitaka, which surround the JR Mitaka/Kichijoji Stations in a 3-km radius (Fig. 1), were chosen as representative districts of "towns in which people want to walk" because a number of people of both sexes and various ages were gathering there, in addition to the proximity of commercial institutions, shopping districts, famous sites and a university. Further, a preliminary investigation of the studied district was performed in May 2005 to develop the survey questions and to determine the questionnaire distribution areas.

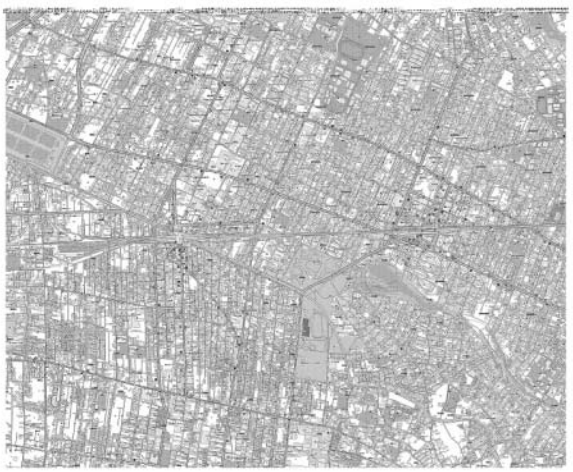

Fig.1. Investigation areas.

The investigation sites were classified into nine areas. The wider areas considered of: Kichijoji Station's North Exit / South Exit "Kichijoji (Fig. 1.-I)"; "Kichijoji Station's North Exit (Fig. 1.-II)" with a nearby station building, a shopping district, and a department store; "The Kichijoji Station's South Exit (Fig. 1.-III)"; "Inokashira Park (Fig. 1.-IV)," where a large store and a general shop were situated near the park; "Southwest (Fig. 1.-VI)"; "Northeast (Fig. 1.-V)"; "Southeast (Fig. 1.-VII)" of the residential areas that were remote from the station; "Northwest (Fig. 1.-VIII)"; and "Mitaka Station (Fig. 1.-IX)" where a station building and a small shopping district were located.

Questionnaire survey and Interview investigation

Questionnaire survey

Two hundred and eighty-five members of the Musashino University Alumni Association and Musashino University attendees received a questionnaire by mail. Residents were extracted randomly from all house addresses in Mitaka City and Musashino City, considering the proportion and age distributions. The questionnaire was distributed on 23 July and collected on 8th August 2005. The mails contained an A1 size black and white map of the area, a questionnaire (A4, 12 pages), six colored pens, and a self-addressed, stamped envelope. The contents of the questionnaire were as follows. We requested respondents to report places, using a blank A1-sized map, to which they felt attracted in daily life and in non-daily life, in addition to areas where they felt anxiety about traffic accidents and crimes. Additionally, answers to subsequent questions (Table 1) were requested. The evaluations were made on a five-point Likert scale and reasons were written freely.

Interview investigation: For inspection and supplementation of questionnaire findings, an interview investigation was undertaken after the questionnaire survey. Cooperation in the interview investigation was elicited among respondents to the questionnaire survey (women, 39.41 (±15) years old) at the Musashino University satellite classroom of the JR Chuo Line Mitaka Station square in September of the year of the investigation period. Detailed explanations of evaluations were elicited from them. Answers related to the following were obtained: age, sex, occupation (office workers / public employees / self-employed / full-time homemaker / student / part-time worker), place of employment (within walking distance / not), environment they grew up in (business district / industrial district / residential area / farm village area / other), length of number of years' residence, reasons for living in the area (transfer / company dormitory / attending school / birthplace / residence circumstances / other), the number of family members living together, presence of children, and age of children.

Table 1.

	attraction of daily life	attraction non-daily life	Traffic accident anxiety	Crime anxiety
Question items	Convenience	Variety	Darkness	Darkness
	Relaxation	Personality	Bad prospect	Bad prospects
	Pleasure	Attention	Uneasiness	Uneasiness
	Cleanliness	Polish	There is much pedestrian traffic	Loneliness
	Nature	Historic	Ill-mannered	Dirtiness
	Brightness	Pride	Separation of the sidewalk and a road	Group of youths
	Not bored	Pleasure	Traffic accident history	Crime happened before
	Favorable	Friendly	High vehicle density	High vehicle density
	Attachment	Not bored	On-the-street parking	Mess
		Brightness	Narrow Streets	
		Favorable		
		Nature		

RESULTS

Respondent profiles

Of the 63 respondents, 60 were females; the overall response rate was 22%. Respondents in their 50s were the most numerous: 24.7% of all the respondents. Those 10–20 years old and in their 30s

accounted for 16.9%. The average age of all respondents was 43 years (±14). Most respondents were full-time homemakers (26%), or office workers / public employees (18.2%). Regarding family status, the mean number of housemates was 3 members. Among the participants, 30 had children. As means of traffic, those by bicycle or on foot accounted for 33.8%. In contrast, respondents mainly using cars accounted for 7%. Furthermore, 51 people had lived their whole life up to that time in a residential area. The average length of residence of these people was about 22 years ±21 months. The proportion of residents who had been born and raised in the investigation area was 29%.

Forming data of the selected areas using the geographic information system (GIS)

Figures 2–5 depict charts showing the overlays of all responses identified by means of the geographic information system (GIS, Arc View8.3; ESRI Japan Co., Ltd.) to form data for the areas marked on the maps. The GIS relates a letter or a number to an image to a map and displays it. Thereby various kinds of information from a position can be unified and analyzed. Information can be viewed with or without a map notation. Visual outputs are a useful technique to communicate information smoothly.

In the questionnaire survey (*Questionnaire survey-1*), the area where one person marked an area on a blank data map was recorded. Data of all respondents were then overlapped (Figs. 2–5). The selected areas are shaded with various darkness; the areas that are the darkest are areas that were chosen most often.

For each of the investigation areas nine ratings were then given a choice-ratio. The wider areas include: Kichijoji Station's North Exit / South Exit "Kichijoji", and "Kichijoji Station's North Exit" with a nearby station building, a shopping district, and a department store; "The Kichijoji Station's South Exit" and "Inokashira Park" where a large store and a general shop were situated near the park; "Southwest", "Northeast" and "Southeast" of the residential areas that were remote from the station; "Northwest" and "Mitaka Station" areas where a station building and a small shopping district were located.

Psychological evaluation structure

Attractiveness in daily life

Regarding findings about everyday attractiveness, the timing such as daytime and evening probably explained choices because the respondents mentioned "going out often" and "going shopping." Furthermore, it can be concluded from responses and accompanying details that the daily-life attractions were judged from the convenience of purchasing daily necessities and the presence of natural

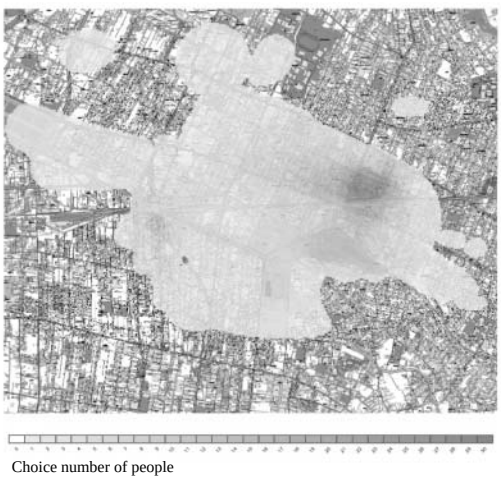

Fig.2. Areas felt attractive in daily life.

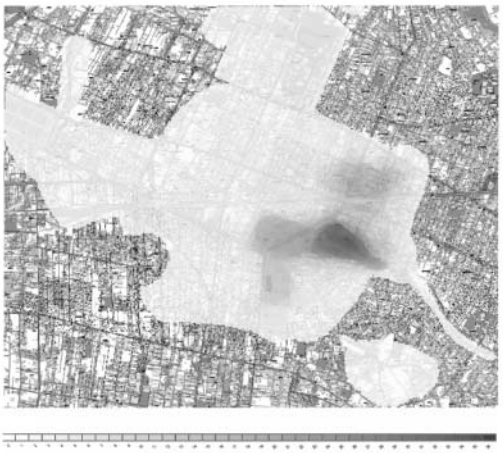

Fig.3. Areas felt attractive in non-daily life.

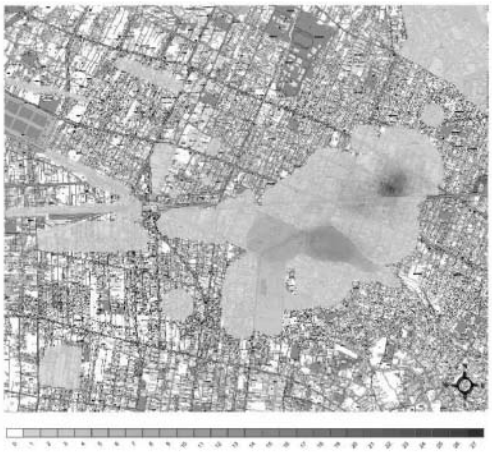

Fig.4. Number of people who worried about traffic accidents.

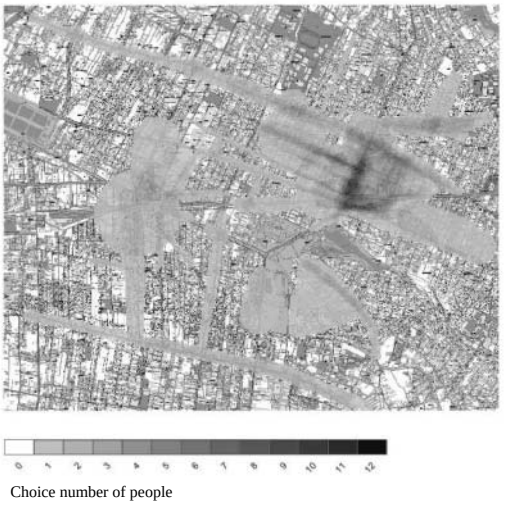

Fig.5. Areas where people are worried about crimes.

Table 2.

		Charm of everyday life	Charm except everyday life	Traffic accident outbreak is uneasy	Crime outbreak is uneasy
Ⅰ	Kichijoji	18.3	12.9	6.5	14.0
Ⅱ	The Kichijoji north exit	23.7	9.7	23.7	23.7
Ⅲ	The Kichijoji south exit	1.1	3.2	8.6	6.5
Ⅳ	Inokashira grace Park	12.9	40.9	2.2	16.1
Ⅴ	The northeast	3.2	4.3	10.8	3.2
Ⅵ	Southeast	5.4	3.2	7.5	2.2
Ⅶ	Southwest	0.0	1.1	3.2	3.2
Ⅷ	Northwest	4.3	4.3	5.4	2.2
Ⅸ	Mitaka Station	10.8	3.2	7.5	6.5

surroundings.

Factor analysis by the principal factor method was performed for nine question items about daily life. The eigen values were 3.30, 1.83, and 0.91. For that reason, two-factor structures were likely to be adequate. Therefore, factor analysis by the principal factor method/Promax rotation torsion was performed assuming two factors. Correlation between the final factor patterns and factors after Promax rotation is shown in Table 3. Factor 1 included six items that appeared repeatedly: “convenience,” “pleasure,” “attachment,” and “not bored”; these were used as the evaluation criteria and named “an ease of life” factor. Factor 2 consisted of three items: “cleanliness,” “natural,” and “can relax,” which were understood as value-adding to the quality of daily life; this factor was designated as a “healing” factor.

Table 3.

Question items	Ⅰ	Ⅱ
FⅠ：An ease of life（Alpha=0.8）		
Favorable	**0.8**	0.2
Not bored	**0.7**	0.0
Attachment	**0.7**	0.0
Pleasure	**0.7**	-0.2
Convenience	**0.5**	-0.1
Brightness	**0.5**	0.2
FⅡ：Healing（Alpha=0.7）		
Cleanliness	-0.1	**0.8**
Nature	-0.1	**0.7**
Relaxation	0.1	**0.5**
Correlation between factors	0.2	

Attractiveness in non-daily life

The findings of attractiveness in non-daily life were related to daytime: the responses included “visited frequently” and “taking a walk”; they fit the business district and the low-storied residential dwellings area.

Factor analysis by the principal factor method/Promax rotation was performed for 12 question items related to non-daily life. The eigenvalues were 5.01, 1.63, 1.41, 1.04, and 0.71. Consequently, four factor structures were believed to be adequate (Table 4). The first factor was designated as a “recreation” factor because the factor included an item expressing what resident could “enjoy without getting tired.” Factor 2 was named the “distinction” factor because three items encompassed much of the town personality. Factor 3 was named a “friendliness” factor because it consisted of three items expressing the character of the town, such as history and friendliness. Factor 4 was designated as an “attractiveness” factor because it consisted of three items that were related to the visitors’ viewpoints.

Table 4.

Question items		I	II	III	IV
F Ⅰ : Recreation (Alpha=0.9)					
Favorable		**0.8**	-0.1	0.1	0.1
Not bored		**0.7**	0.2	0.1	0.1
Pleasure		**0.6**	0.2	-0.1	0.4
F Ⅱ : Distinction(Alpha=0.8)					
Personality		0.1	**0.9**	-0.1	-0.1
Variety		0.2	**0.8**	-0.1	-0.2
Attention		-0.3	**0.5**	0.2	0.5
F Ⅲ : Friendliness(Alpha=0.8)					
Nature		0.1	-0.2	**0.8**	-0.2
Historic		-0.1	0.1	**0.8**	0.0
Friendly		0.4	0.2	**0.5**	-0.2
F Ⅳ : Attractiveness(Alpha=0.6)					
Pride		0.1	-0.1	0.5	**0.2**
Polish		0.2	-0.1	-0.2	**0.7**
Brightness		0.4	-0.2	0.1	**0.6**
Correlation between factors		I	II	III	IV
	I	—	0.3	0.4	0.3
	II		—	0.4	0.5
	III			—	0.4
	IV				—

Anxiety about traffic accidents

No answers assumed components related to night time, and many responded that the anxiety was present regardless of the time of the day due mainly to the heavy traffic. In addition, the selected areas were concentrated near highways and crossings, which overlapped with the areas that actually had high accident rates.

Factor analysis by the principal factor method was performed for ten question items related to anxiety due to road traffic accident development. The eigenvalues were 2.24, 1.81, 1.66, 1.16, and 0.82: a four-factor structure was believed to be adequate. Therefore, four factors were assumed again, and factor analysis by the principal factor method/Promax rotation was performed. The correlation coefficients between these factors were approximately perpendicular at 0.31, 0.20, 0.20, 0.09, 0.02, -0.01. Therefore factor analysis by the principal factor method/Varimax rotation was performed (Table 5). The accumulated contribution ratio was 50.95%. Each factor was interpreted as follows. The fibrinogen was named a "street factor" by having consisted of three items to show infrastructure

Table 5.

Question items	I	II	III	IV	A commonality
F Ⅰ : Street factor (Alpha=0.7)					
Narrow Streets	**0.9**	0.1	-0.1	-0.1	0.3
Separation of the sidewalk and a road	**0.8**	0.0	0.1	0.0	0.8
There is much pedestrian traffic	**0.4**	0.0	0.4	0.3	0.4
F Ⅱ : Traffic visibility factor (Alpha=0.6)					
Bad prospects	0.1	**0.9**	0.0	-0.1	0.4
Traffic accident History	0.0	**0.5**	0.1	0.1	0.9
F Ⅲ : Morals factor (Alpha=0.4)					
Ill-mannered	0.2	0.4	**0.8**	0.1	0.6
On-the-street parking	-0.2	-0.2	**0.4**	0.1	0.3
F Ⅳ : Traffic density factor (Alpha=-0.1)					
High vehicle density	-0.1	0.0	0.2	**0.6**	0.4
Uneasiness	0.0	0.4	-0.1	**0.5**	0.2
Darkness	0.0	0.3	-0.2	**-0.5**	0.8
Factor contribution	1.7	1.4	1.1	1.0	5.1
Contribution rate	16.6	13.7	10.5	10.2	51.0

maintenance. Factor 2 was named a “traffic visibility factor” by having consisted of two items. Factor 3 was named the “morals factor” by combining two factors such as manners. Factor 4 was named the “traffic density factor”; it consisted of three items reflecting traffic density.

Anxiety about Crimes

According to findings related to crime anxiety, the areas where people felt anxiety coincided with areas where serious crime and bicycle theft occurrences were frequent (Metropolitan Police Department, 2005). However, estrangement is seen in break-in thefts (Metropolitan Police Department, 2005).

In addition, “The Kichijoji North Exit” was listedÅ@at the top with 23.7% as the “place causing crime anxiety,” followed by 16.1% for the “Inokashira Park”. Many office workers and part-time workers were respondents who chose the Inokashira Grace Park.

Furthermore, many residents citing gloomy surroundings felt that there “were few streetlights” that “prospects were bad”. The answer “dark” was commonly given, and contents to show physical contents such as “paths are narrow” and “had many trees” and “bad atmosphere of people there.” or “little pedestrian traffic” as well as an atmosphere of the urban area were cited as particular evaluation reasons.

During the interviews, responses indicated that “crime areas” are conceptualized from a viewpoint of an assailant: “dark.” “low visibility,” and having “hiding places.” In addition, for the night environment, an answer “streetlights were covered by trees, and I feel a sense of being oppressed” was given.

DISCUSSION

Attraction

An area chosen based on past findings (Iwai, 2005) showed that the viewpoints of evaluation was different between attraction in daily life and attraction of non-daily life, and this was used as a hypothesis for examining the results of this investigation.

The choice area ratio (Table 2) was different as to attraction of non-daily life and attraction in daily life. Respondents who chose “Kichijoji” as the attractive area in daily life accounted for 18.28%. Of all respondents, 12.90% chose “Inokashira Park.” In contrast, respondents who chose “Inokashira Park” as the area where attractiveness of non-daily life existed accounted for 40.86%. Of all respondents, 12.90% chose “Kichijoji.” However, differences such as those described below were apparent for the ratio and five phases of evaluation for a chosen area and the evaluation reason.

Attraction in daily life

“Attraction in daily life” apparently assumed that “shopping” was done repeatedly in daily life at “noon-time” or in “the evening,” as implied by the questionnaire survey results. In daily life, concrete factors such as the number of stores and hospitals, and public accommodations received high evaluations, and commuting and attending school were facilitated by “being near a station.” These accord with items arranged as “an ease of the living” factor of factor analysis (Table 3). In recognition of the “natural numerousness,” unevenness was cited in an answer that had abundant green in a park or a residential area. However, “relaxation” was probably mentioned as related to substantiality of institutions such as a cafe or a park and a positive evaluation reason it “was quiet, and to be reliable” or “I lived so long”.

Using these five phases of evaluation and evaluation reasons and the results of the factor analysis, the author estimated a structure of attractiveness in daily life in consideration of coefficients of correlation as follows (Fig. 6).

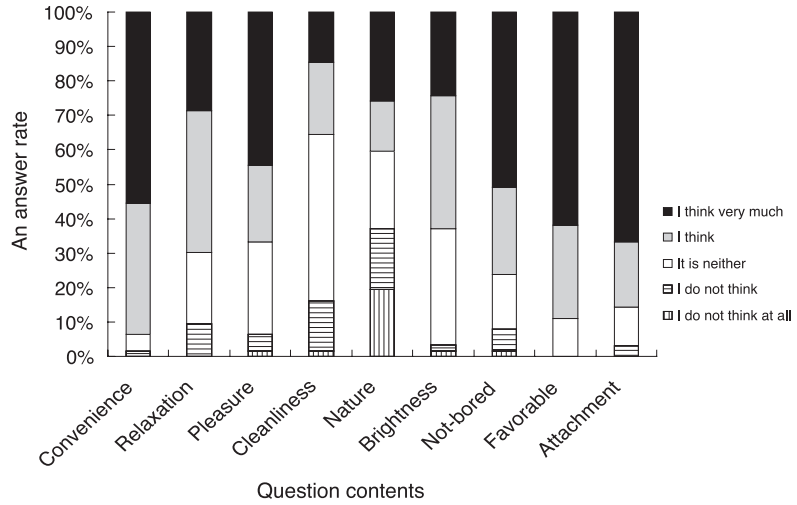

Fig.6. Attractiveness evaluation components of a town in daily life.

Attraction of non-daily life

In the questionnaire survey, responses as to "attraction of non-daily life" assumed at "noon-time" by the reason of "a walk" accounted for 63%. In relation to the respondent profile, a lifestyle taking a walk and shopping are presumed to occur during daytime because many respondents were full-time homemakers.

From the five phases of evaluation and evaluation reasons, many responses mentioned convenience. However, in relation to substantiality such as a store and public accommodation in daily life, many mentioned attachment and friendly feeling by having continued living there for many years. As convenience for non-daily life, the respondents felt it important to make an excursion to various stores. In addition, respondents preferred the nature of the urban area because they felt the four seasons and did not get tired of them. This agrees with results of the interviews that the local common places with abundant nature stimulated attractiveness of an urban area. In other words, numerous elements related to choices and characteristics are important as they are favourable for better quality of life. Residents presumably find an added value in the feeling that an area is far "from the large space and functions as a remote area from daily life without affecting the area where access to the downtown area is easy.", as in the case of symbolic areas such as Inokashira Park, which have abundant nature. Based on these, a viewpoint to evaluate the attraction of non-daily life might be harmonious with institutions having the scale merit of a city with the natural environment as seen in Inokashira Park.

Furthermore, as for attraction in daily life, the evaluation structure can be formed in consideration of correlation coefficients (Fig. 7).

This investigation showed that "convenient access" and "existence of institutions" such as stores and public accommodation or hospitals were estimated as charm points of a town in everyday life. In contrast, as attraction of non-daily life, harmony of "substantiality of commercial institutions" and

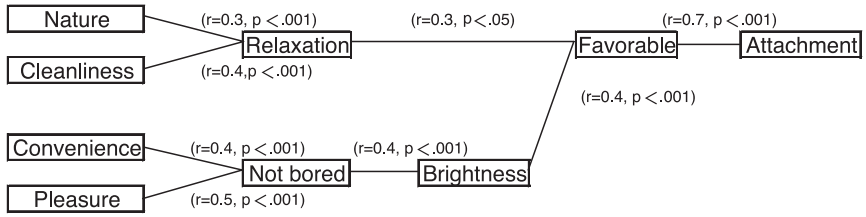

Fig.7. A town's attractive components related to non-daily life.

"abundant nature" was estimated to give an added value to the quality of urban environment. In other words, the attraction that a resident pursued in an urban area depended on the situation, which may clarify the differences produced in evaluation contents for the same area.

Anxiety

A hypothesis of this study was "elements causing anxiety about traffic accidents and crimes in an area are considered when estrangement is apparent in a chosen area and in areas with frequent accidents or crimes." An overlap is inferred for an area chosen as producing traffic accident anxiety and an area where a traffic accident really occurred. A resident can recognize danger about traffic accidents.

Areas with crime anxiety and areas where crimes really occurred were overlapped. That area coincides with the area where serious crimes and bicycle thefts occurred. However, robbery and snatching thefts occur in areas where residents may not chose. Consequently, the results show a tendency that residents are conscious of crimes and always feel endangered, but this tendency is not seen as to invasion thefts. That fact implies that the recognition of a resident is different about crimes in an urban area by the kind. In other words, regarding areas where residents are not aware of crimes, a system announcing concrete information such as environment factors to cause crimes is necessary as well as the information about their occurrence.

Differences including the following were apparent in responses about traffic accident anxiety and crime anxiety.

Anxiety about traffic accidents

Questionnaire findings revealed that respondents always feel endangered irrespective of time. Furthermore, as for the times when traffic accidents occurred, for both Mitaka and Musashino, 8:00–18:00 was the peak period; the accidents during this period are increasing (Metropolitan Police Department Mitaka Police Station, 2005, Metropolitan Police Department Musashino Police Station, 2005). According to Yamaguchi et al. (2005), crossing areas tend to attract more attention than other places; it is assumed that locations in such areas are easily recognized. Therefore, highways play the roles of landmarks. Concerning the anxiety of traffic accident occurrences, residents had a good grasp of the actual occurrences or environments that reminded them of accidents were present. In addition, factor analysis shows that residents feel anxiety about traffic accidents based on traffic density in a street and not only visibility but also morals of drivers and pedestrians. The interview investigation showed that areas with vigorous pedestrian traffic were attractive urban areas. A person recognizes important elements constituting an urban area.

Because time consciousness was not taken into consideration, questions related to darkness were mostly answered in the negative, but for other questions, it was assumed that affirmative answers were obtained; the figure below was prepared taking into account the related correlation coefficients (Fig. 8).

Anxiety of Crime

In their answers, many respondents assumed that crimes were associated with "night". In addition, five phases of evaluation results indicated that residents developed crime anxiety from the physical environment: "dark," "bad prospect," and an impression of a town that may "lack in downtown popularity" and "persons who are there are bad". About the physical environment, evaluation reasons seem to be "there are few streetlights", "paths are narrow" and "many trees." However, evaluation results suggest that residents feel anxiety from disharmony of buildings and trees. Furthermore, there are overlaps as to an area with crime anxiety and area where bicycle thefts occur. Small crimes produce a feeling of disorder and, as a result, it is connected with felony (Kelling 2004). A chaotic feeling occurs by an illegally parked bicycles appearing in urban areas, which induces crime anxiety of residents.

The evaluation structure might be shown as follows (Fig. 9) based on the coefficients of correla-

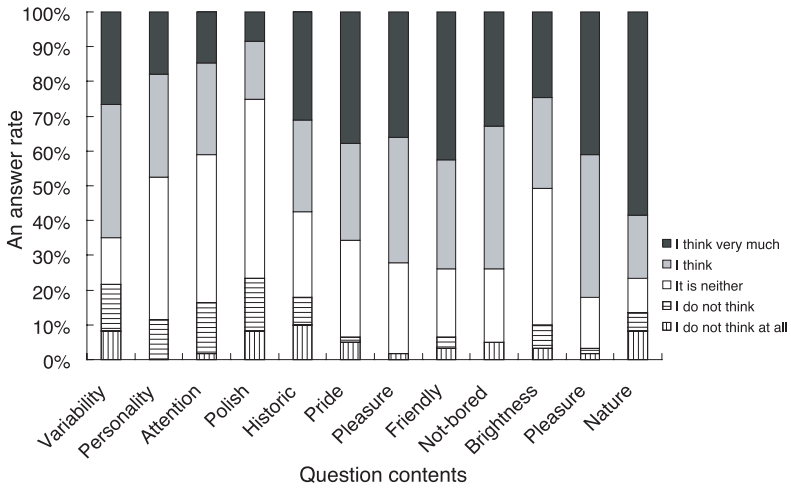

Fig.8. Evaluation components of road traffic accident anxiety.

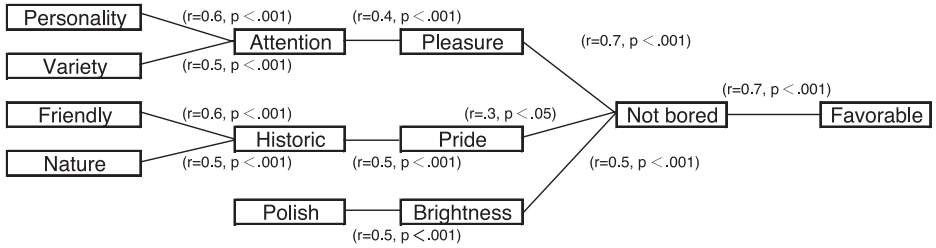

Fig.9. The evaluation structure of crime anxiety.

tion and these considerations.

Regarding traffic accident anxiety, landmarks such as crossings or a highway and traffic jams or person were factors of anxiety. Residents might presume danger from this mainly from the physical environment. In contrast, as for crime anxiety, residents made judgments by paying attention to the town atmosphere and physical environment. Evaluations related to anxiety of an urban area, unlike attractions of an urban area evaluated by the reason of a store and natural environments, are likely to be strongly influenced by the physical environment and impressions of people coming and going there.

Through this study, a psychological structure model for environmental assessment was drawn up by finding the attractions in daily life and non-daily life that have different impacts on the residents' assessment of their environment and the uneasiness and consciousness of safety in terms of traffic accidents and crimes. We plan further research to verify the psychological assessment structure using statistical methods such as covariance structural analysis. We also plan further accumulation of data and consideration of responses to clarify the assessment structure influencing the consciousness of the history and town infrastructure and the residents' personalities. Through the clarification of the assessment structures, we might be able to prepare materials for obtaining a consensus for building a better urban environment.

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was obtained from members of the “Murasaki Society.”.

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