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Abstract

Relation between spatial form and functional performance has been investigated in a comparative study of two housing estates located in the city of Gdansk in Poland. One of them has the opinion to be one of the safest in the city, on the contrary to the second one, even though both seem to show similarities in terms of their built form (architecture, location) and social structure. Two questions were put forward: why formally very similar estates do not perform functionally in the same way and what factors determine the difference in security perception?

The morphology of these estates is characterised by the modernist approach (buildings put in an open space according to a geometrical composition). The housing is arranged in ten storey blocks of flats built in 1970s. The residents revealed their perceptions concerning built form characteristics (area, center, landmarks, legibility), use of space and the security of open spaces through 150 questionnaires applied in each estate. The perception of built form was also compared with the analysis of cognitive maps drawn by some of the respondents to distinguish the elements (according to Lynch) which inhabitants use actively. The crime situation was observed via analysis of crime data (annual reports). These results were confronted with the Space Syntax Analysis of spatial configuration (Axman), backed up by field observation of movement (gate method).

The results of this study emphasise the role of intelligibility as the factor determining open spaces to be perceived by inhabitants as less vulnerable to crime. In studied housing estates it is impossible to predict the distribution of robbery (cars, flats), but there can be found relation between spatial characteristics of low intelligibility and low integration value and the perception of insecurity registered by questionnaires and the presence of certain pathological incidents (e.g. assaults and battery, aggressive and antisocial behaviour).

Spatial Order and Security - Case Study of Two Housing Estates

The problem of safety in large housing estates is usually associated with the negative perception of architecture itself seen as a poor environment for development of social bonds in the neighborhood. The paper presents a different approach looking at the problem of safety from the spatial point of view. One can find much research on crime-space relationship (e.g. Hillier, Shu 1999, Shu 1999) concentrating on property offences (burglary, criminal damage) in housing estates. They are usually investigating rather intensive low-rise housing estates with a relatively well shaped street system. In this paper the relation between spatial form and functional performance has been investigated in a comparative study of two high-rise housing estates. Both are located in the city of Gdansk in Poland. The first one (called Zabianka) has the opinion to be one of the safest in the city (Zalecki 2003), on the contrary to the second one (called Zaspá), even though both seem to show similarities in terms of their built form (architecture, location, urban context of surrounding) and social structure. The morphology of these estates is characterised by the modernist approach (buildings put in an open space according to a geometrical composition). The housing is arranged

in ten storey blocks of flats built in 1970s. Most of the inhabitants became residents in 1970s and never moved out unless they decide to built a house on the city outskirts. Both housing units have good location in relation to green areas along the sea coast and to shopping centres and sport facilities. Both are well served by public transportation system. One can observe the second generation of inhabitants choosing to live and bring up their children here.

Study was focused on analysis of urban form and performance of the environment as a place for social or anti-social behavior to make an attempt to explain why one of the estates is commonly recognised as safe. Two questions were put forward: why formally very similar housing estates do not perform functionally in the same way and what factors determine the difference in security perception? Methods used in the study include: statistical survey (questionnaires), analysis of cognitive maps, field observation of movement (gate method), Space Syntax Analysis (configurational model), crime data analysis. To simplify the description later on in this paper, the neighbourhood unit Zabianka will be further named as – housing estate (or unit/area) A; while Zaspá – as estate (unit/area) B.

The question about perception of urban form puts forward the problem of its identity and the distinction of neighbourhood as a separable entity. At the starting point in this study, Kaplans' model of environmental preference was taken into consideration (Kaplan, Kaplan 1982). This model points at 'coherence' and 'legibility' as factors influencing both preference and environmental fear enhancing understanding and search for sense – both underlying any activity in any environment. According to this model 'complexity' and 'mystery' enhance the activity of exploration, however people may sustain their preference for mystery as well as begin to fear when facing the situation of no choice when being forced to enter mysterious scenery. The physical characteristics of any urban environment has the potential to affect the acquisition of spatial knowledge allowing people to familiarize themselves with the environment, move around and spatially orient themselves (Bell et al 2004, Carmona 2004).

Lynch - in 'The Image of the City' – was the first to refer to this potential effect of the environment with the term 'legibility' (Lynch, 1990) and argued that it is a significant quality of the city. The legibility of the city is "the ease with which (a city's) parts can be recognised and can be organised into a coherent pattern". This approach emphasises identity by means of distinctive visual quality. Lynch associates legibility with 'imageability' - "probability of evoking a strong image in any given observer".

On the other side, in researches related to space syntax, the ease of perception of a place and the effect of configuration on its users has been discussed with the notion of 'intelligibility' introduced by Hillier (Hillier 1988, Hillier 1996). The intelligibility - as the structural property of urban system - "... means the degree to which what we can see from the spaces that make up the system - that is how many other spaces are connected to - is a good guide to what we cannot see, that is the integration of each space into the system as a whole." The definition of intelligibility concerns the relationship between local visual cues and the global properties of a space within a system. In an intelligible world, the relationship between local and global properties of space is strong, and it helps in efficient navigation.

In the research clues for both notions – legibility and intelligibility – were studied to obtain a wide perspective on inhabitants' knowledge and perception of their neighbourhood to arrive at an attempt of explaining the difference in perception in security.

Geometry and perception of urban form.

When investigating urban forms understood as formal gestalt or "surface" pattern (Figure 1), it is enough to have a glance at the plans of both housing estates and observe a distinct difference in their geometry. Estate B can be seen as a regular geometric pattern resembling honey combs and this feature was highly recognized as the distinct quality of this urban form and received an award for good urban design at the time of its erection (1970s). On the contrary, estate A was at that time highly criticized for having non-distinctive urban pattern.

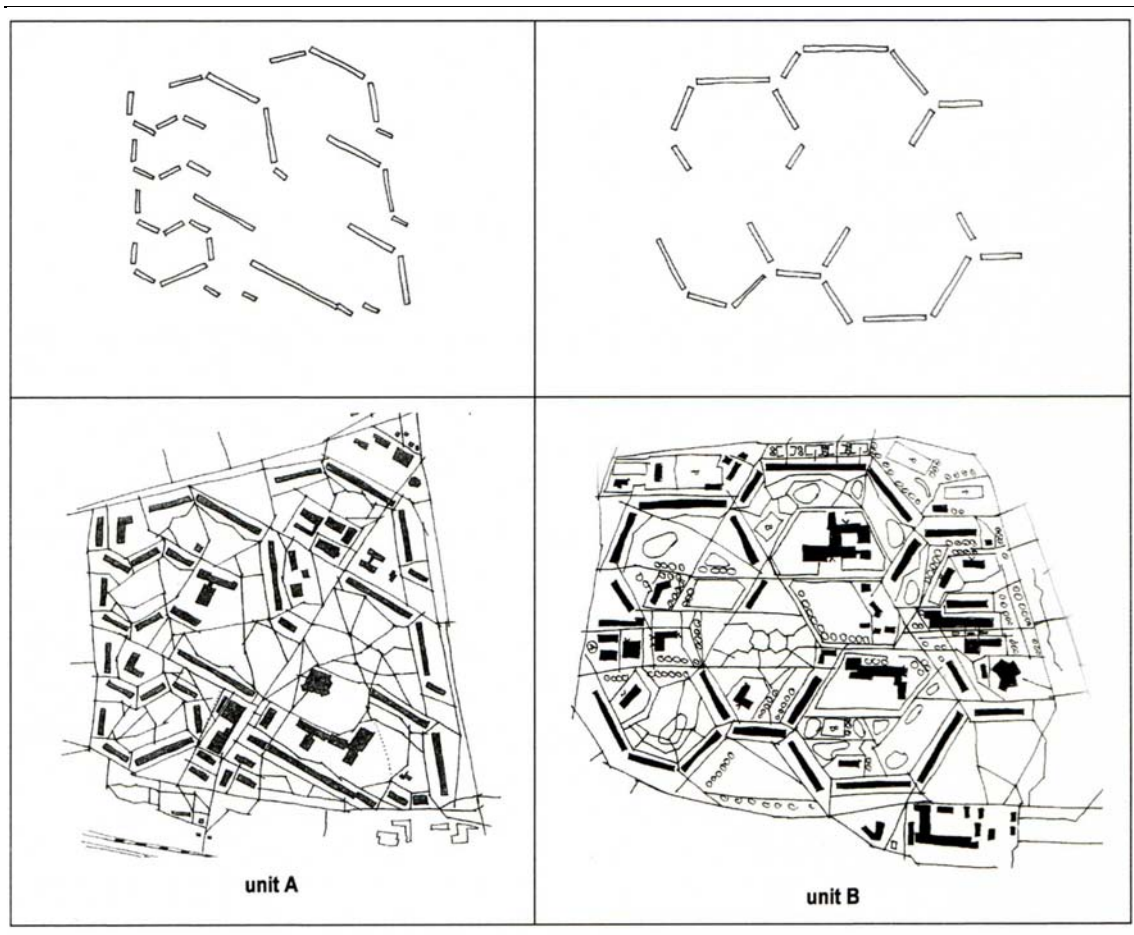


Figure 1

Geometry of urban form (top) and the plan layout (bottom) for housing estates A (left) and B (right).

Investigating the perceived features of built environment served as a starting point for the analysis of spatial form of these chosen housing areas. The residents revealed their perceptions concerning built form characteristics, use of space and security of open spaces through 150 questionnaires applied in each estate (the study was executed in 2003/2004).

First, inhabitants - taking part in the questionnaires - were asked to specify which area they recognize as their neighbourhood (unit) and to identify its centre. Then some of the respondents were asked to draw the plan of their neighbourhood unit. The first research question was: how the area perceived as the housing unit is related to the administrative borders and whether both estates are perceived as wholes. 3/4 of respondents from estate A associated their housing neighbourhood with the administrative borders, while for estate B the number of similar answers came down to half of the respondents. This lower number for B might be partially explained by the fact that neighbourhood B is a part of a group of few units forming a bigger administrative district, so that some of the respondents identified themselves with the larger area. However, it is interesting to point out the expression used by respondents from estate A: they mentioned "the estate builds one whole". The question about the position of estate's centre revealed that in estate A almost everyone agreed that such a centre existed and they pointed public space associated with the main pedestrian route, while some the respondents from the other estate B (12%) stated that there is no centre, or found the existing centre as not sufficient to be named as one. They described it as "merely a location point for shops and other facilities".

The results of the questionnaires on the subject of perception of built form were compared with the analysis of cognitive maps drawn by some of the respondents to see whether and how they comprehend spatial form, do they know well its image (as understood by K.Lynch 1990). The research question was: how the features of spatial form influence the way maps are drawn?

It is important to point out that the maps were drawn by people who lived in the area for a long time (most of their lives, e.g. 20 years) and gained a good knowledge of it. It is possible to point out distinct differences in the way the maps were drawn. (Figure 2) Sketches of estate A (75%) represented the area of the whole housing unit. The maps were clear, legible, and they reproduced sufficiently most important urban elements as well as their spatial relations. Maps of area B – on the contrary – were fragmented, showed different parts of this estate, and urban elements were represented in a chaotic way. Most of these maps represented just 3 or 4 adjacent elements related to one of the periphery roads or railway line external to the housing unit itself. In the case of estate B it is evident that almost all the respondents drew a much smaller area than the one pointed out in the questionnaires. Does it mean that they do not know their neighbourhood? Or maybe there are not enough distinct urban elements in the spatial form?

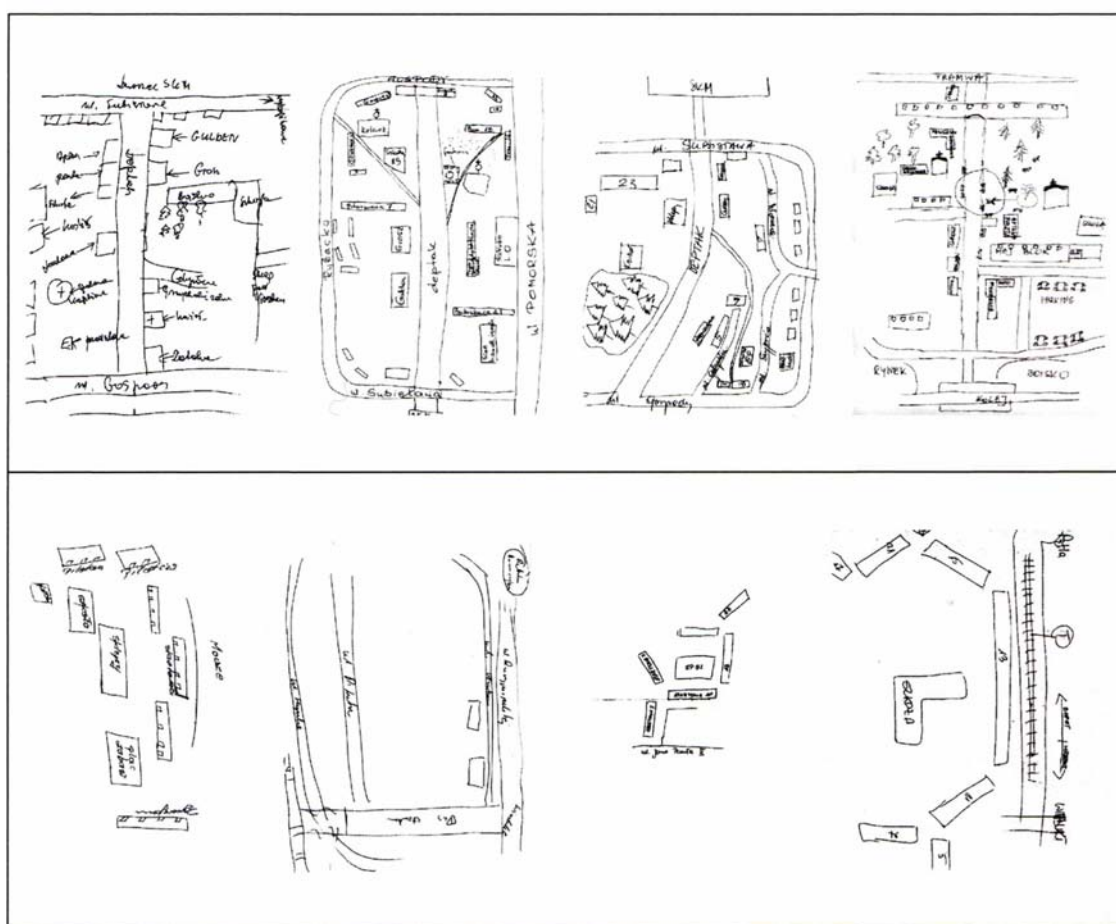


Figure 2
Examples of maps of the housing units drawn by inhabitants: unit A (top), unit B (bottom)

It is worth remembering that earlier questionnaires revealed that all respondents in both estates could actually name at least a few characteristic urban elements that might be useful for navigating space. Out of elements distinguished by K. Lynch – edges, paths, districts, landmarks, nodes - landmarks were most often mentioned. However one could not find these earlier pointed out elements on the actual maps in the case B. While respondents from A – who named much more characteristic elements – positioned many of them on their maps. It seems justified then to draw the conclusion that inhabitants of estate A must somehow have a better, deeper knowledge of their living environment that enabled them to produce a reasonable representation of their housing estate.

Space navigation

Analysis of urban form and its perception was accompanied by the investigation of the way in which space is actually used for movement. First, inhabitants were asked to define: 1) to what extent they find urban form helpful in wayfinding, and 2) do they encounter problems of this matter

themselves or know about such cases from newcomers. 2/3 of the respondents from unit A find urban form of their estate helpful to move around, while in estate B there are only 43% of positive answers to this question. In estate B, the percentage of people who reported problems of getting lost during their first visit to the area is also high - 66% (in case A – only 30%). Asked about the reasons, respondents pointed at urban structure as problematic in the first place. They blamed also architecture saying that blocks of flats are either too dispersed or too compacted to allow for good orientation. The problem of clear building numbering appeared to be less important. It is interesting to observe that buildings - blocks of flats – in both analyzed areas are almost identical (the only difference is that the facades of many buildings in estate B look better as they obtained outstanding murals painted by local artists), but architecture in the case A did not gain so much criticism.

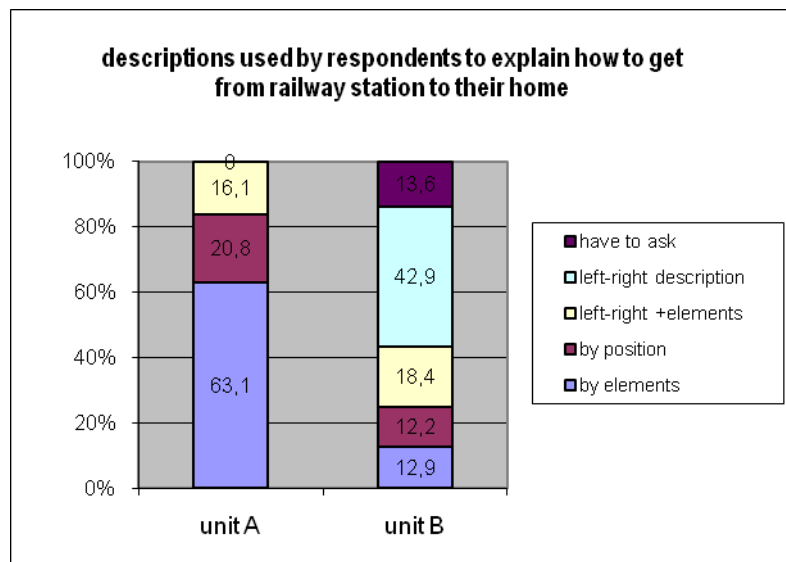


Figure 3

Analysis of instructions given as guidance descriptions for visitors to the area.

Inhabitants were also asked to prepare written instructions: how to find the way to their home from the platform of local railway station. Analysis of these descriptions revealed interesting observation: respondents used different strategies to cope with the task. (Figure 3) Instructions for area A were short, one- or two-sentence long and most of them described the way either by pointing a few urban elements - as defined by K. Lynch (Lynch, 1990) - or by indicating the position of a given block of flats directly in relation to one of distinct urban elements (84%). The routes indicated usually the shortest possible way through. Whereas descriptions for area B appeared to be very detailed and long, and numerous left or right-turns were the most often used strategy (2/3 of respondents). At the same time respondents tended to choose indirect routes. Moreover, 15% of respondents in area B refused to answer that question or proposed to ask someone else on the way as the best solution. This brings into mind two types of space learning strategies described by E.C.Tolman (Rathus, 2004) in his study of rats' behavior during exploration of labyrinths. The first one allows for learning a place as a location related to other elements in space, the second one, used in labyrinthine surrounding, comes down to mere activity of muscular system and requires assimilating information about directions and number of turns (learning by heart). The inhabitants of case B applied the long description strategy. Visual elements of form – even though remembered by inhabitants – were not sufficient for comprehending the spatial form, therefore could not be actively used for movement. Instructions for case A revealed the first learning strategy. Respondents actively related urban elements such as landmarks to the frame of spatial grid, here represented mainly by the main pedestrian route working as a spine in 'skeleton' of space structure. This result emphasises the role of linear urban elements – as paths allow for simultaneous active exploration and direct perception as postulated by Gibson (Gibson 1979). The importance of path-elements indicated also by Kuipers (2003), Conroy-Dalton (2003)).

Spatial configuration and movement patterns

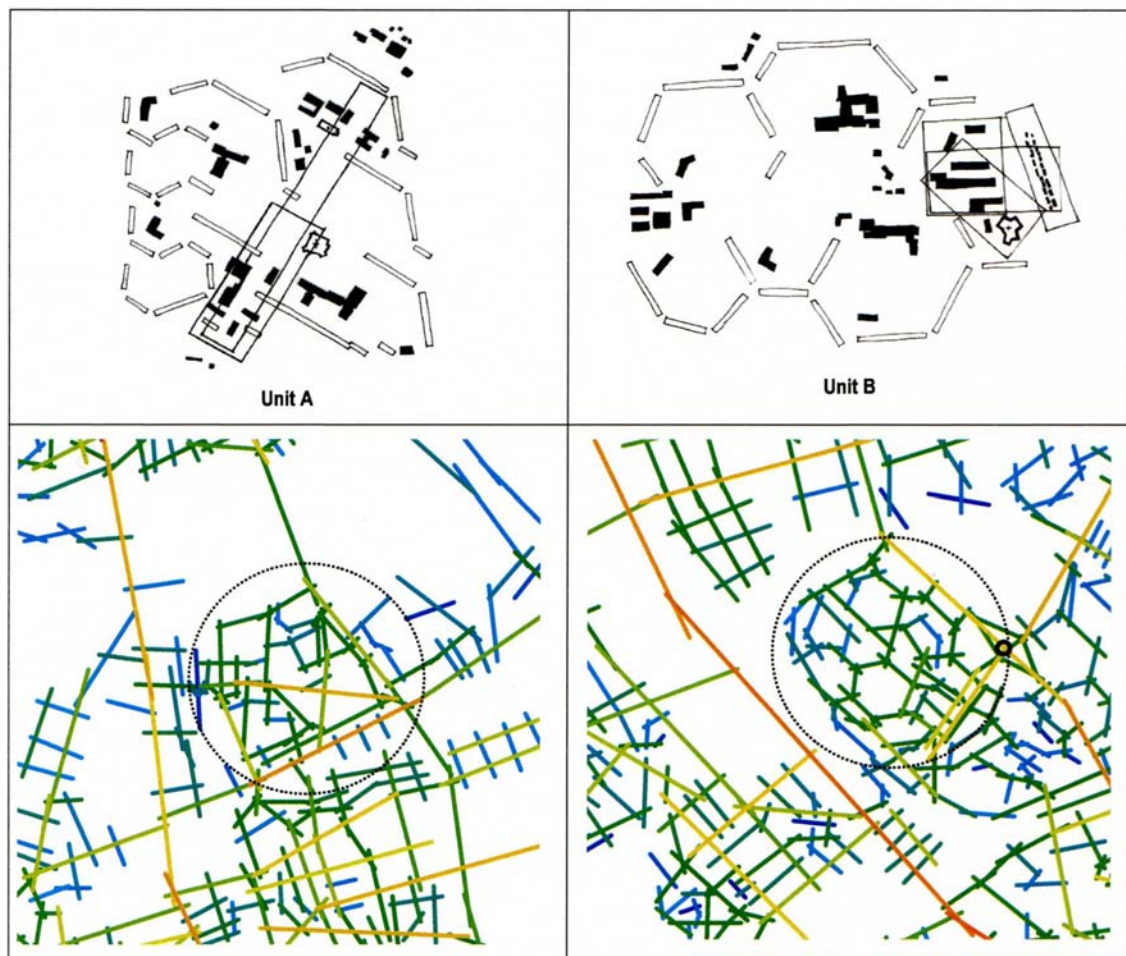


Figure 4

The perceived area of centre (marked by rectangles on the top maps). Below axial map configuration (IntR3) - unit A (left) and unit B (right)

syntax parametres	UNIT A		UNIT B	
	including major periphery road	without periphery road	including major periphery road	without periphery road
mean IntR3	2,25	2,21	2,18	2,11
mean IntRn	0,72	0,71	0,67	0,67
R ² (IntR3/IntRn)	0,3226	0,305	0,1659	0,0856
mean Con	3,87	3,78	3,79	3,62
R ² (Con/IntRn)	0,1901	0,1612	0,1033	0,034

IntRn – global integration, IntR3 – local integration, Con – connectivity, R²- intelligibility

TABLE I

Housing units A and B: characteristics of spatial configuration

These results were confronted with Space Syntax Analysis of spatial configuration (Axman), backed up by field observation of movement. The axial maps (Figure 4) confirmed the presence of integration core in the case A: the line of main pedestrian route appeared to be its most important element. Estate B lacks this kind of integrating internal element. Mean integration values IntR3 – indicated in TABLE I - show much higher rates in case A. The value of intelligibility for both units are represented in the table. Unit A has a reasonable level of intelligibility – 0,32 (by comparison intelligibility parameter for Gdansk city centre including historical old town is 0,46 (Awtuch 2005)).

For unit B intelligibility seems dramatically low and comes down even more if we exclude the road adjacent to it – 0,085.

Both models were correlated with the actual movement patterns measured by the observation procedure, known as gate method (52 gates for area A and 62 gates for area B), to observe correlation of integration values (IntR3) with movement rates in space (Figure 5). The correlation for area A is 0,76 and proves that axial model is a good predictor of movement patterns, while for the area B the correlation is a bit lower (0,65), but still allows for formulating predictable conclusions on spatial characteristics and movement patterns.

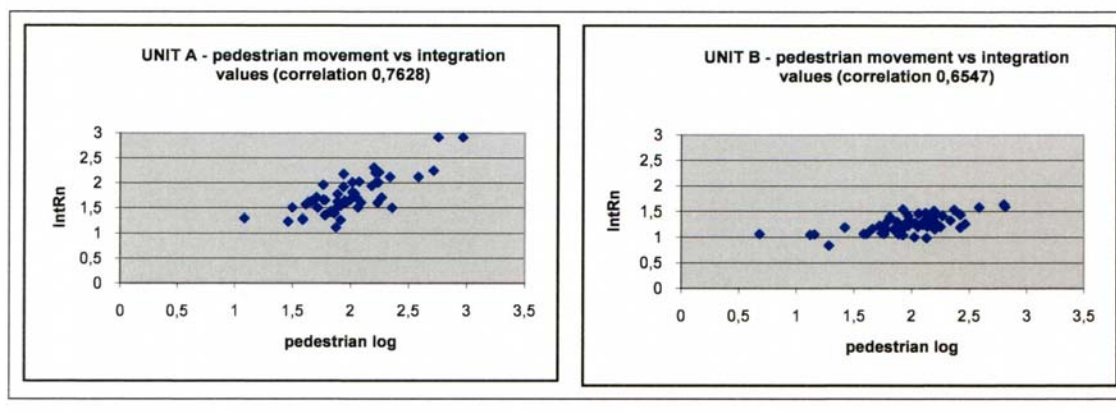


Figure 5

Pedestrian movement and integration values correlation.

In unit B movement concentrates on its outskirts. People move along periphery roads – 2,3-2,6 persons/min, while in the interior open public space movement rates remain very low - 0,6-0,9 persons/min. The only exception is the shopping area where one can observe 4-10 persons/min depending on which part of this centre we look at: generally movement diminishes as one moves toward the housing unit interior. This type of movement pattern was described by Hillier (Hillier 1988, Hillier, 1996) as typical for contemporary disintegrated housing areas. Area of unit A is characterized by a different pattern space use: movement concentrates inside the housing estate, (7-15 persons/min recorded on the main pedestrian route and 2,5-4 persons/min on the secondary, adjacent passages). These numbers come close to rates of movement intensity indicated in literature as appropriate for urban liveliness (Whyte 2001, Gehl 1996).

* * *

Summarising the analysis of spatial form, one might say that area A demonstrates the characteristics resembling to some extent historical urban fabric working as “mechanism for generating contacts” (Jacobs 1968, Hillier 1996). It is characterised by coherent logic of space - in terms of its composition, configuration and patterns of movement; its configuration reveals relatively high levels of integration and the presence of integration core. Most of the movement can be observed in central areas, where public space is used by inhabitants on the day to day basis. Area B is characterised by the lack of internal logic: as patterns of movement do not relate to patterns of urban composition; configuration map shows low levels of integration parameter and lack of internal integration core. Movement in this area is dispersed, as inhabitants use mainly space in the vicinity of their blocks or move along the periphery roads.

Perception of security

The crime situation was observed via analysis of crime data (annual reports). The sense of safety in public places, distribution of antisocial behaviours (drinking alcohol in public, assaults) was analysed on the basis of the second part of the questionnaires mentioned above.

The good opinion about safety of area A was not directly confirmed by the crime rates found in police data. The average numbers of flat burglary rates, car robbery for both housing estates are similar. The high number of shop burglary in the shopping centre of unit B is the main exception. This shopping area is located within the spatial structure of housing unit, and seems completely deserted after the opening hours. Recently the post office located there shortened its opening hours as a consequence of safety procedure following the incident of robbery in this institution. Police data confirm that in area B there were reported more often cases of mugging, numerous incidents of drinking alcohol in public (which is illegal in Poland). Moreover, the questionnaires confirmed this situation: 2/3 of inhabitants of area B fear of falling victims to assault and 40% are afraid of battery. Furthermore, inhabitants of this unit observed and mentioned in the questionnaires perceived higher rates of mugging as well as assaults and battery, alcohol consumption in public places and vandalism. This differentiation can be observed also in the decisions inhabitants make when choosing their way back home after the dusk. In unit A inhabitants quite often decide to take the shortest way possible and are not afraid of empty public spaces where one can see who approaches. In the evenings and nights 2/3 of respondents from unit B preferred to choose well lit pedestrian paths or these routes where there were other people.

The questionnaires also investigated the inhabitants perception of safety in relation to different types of spaces within the surrounding: direct vicinity of the block of flats where the respondent lives, open public space in the middle of the estate and the perception of security in the shopping area. Inhabitants in unit A generally find space around blocks of flats safe (usually it is open green area with playground facility) even if there are not many people using it (almost 70% of respondents), while the half of respondents from unit B recognize the vicinity of blocks as unsafe and hardly used. Among respondents from unit A opinions about open public space right in the middle of the housing unit vary. Most of people agreed that this is a very popular and busy place, but some find it safe and some unsafe. 60% of respondents from area B said that the equivalent public space in their estate is unsafe and seems deserted. Figure 6 compares the results for both central public spaces.

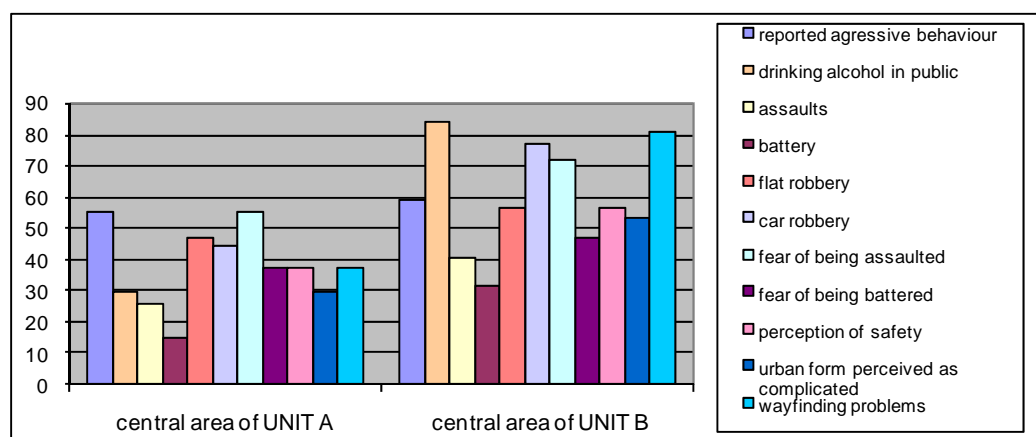


Figure 6

Characteristics of central area in the middle of the housing estates – comparison of unit A (left) and unit B (right). Indicated rates (%) for: cases of aggressive behaviour, drinking alcohol in public, assaults, battery, flat robbery, car robbery, fear of being assaulted, fear of being battered, perception of safety, urban form perceived as complicated, problems with wayfinding)

Furthermore, perception of security in the studied areas appeared to be not so much connected to occurrence of offences and anti-social behavior but is related to perception of spatial form. (Figure 7) In case A – which is intelligible spatial form – even if criminal offences take place they are not directly accompanied by as low indexes of sense of security as it takes place in estate B. In area B – unintelligible spacial structure - even the lack of negative events in the vicinity is perceived as not sufficient to feel safe as it is observed in case A.

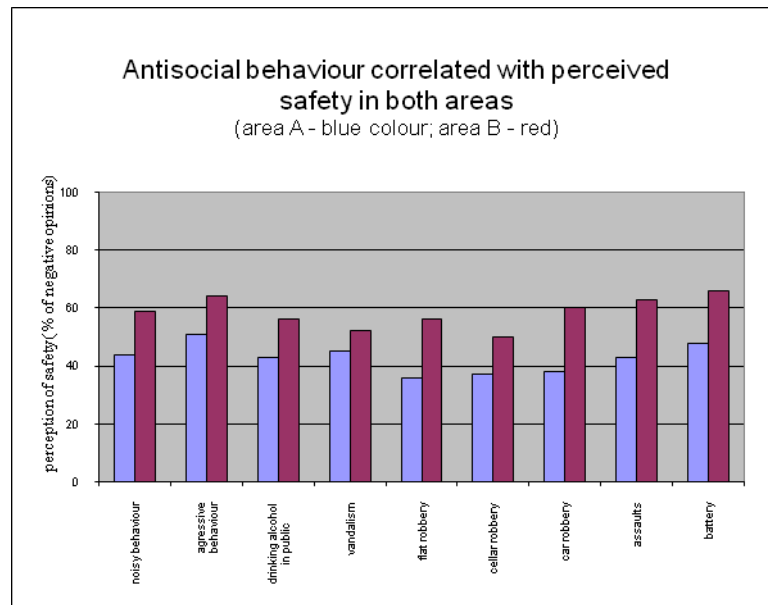


Figure 7

Perception of safety in the vicinity correlated with the occurrence of antisocial behaviour in both housing units.

Conclusions

The results of this research emphasize the role of intelligibility as the factor determining open spaces to be perceived by inhabitants as less vulnerable to crime. In investigated housing estates it is impossible to predict the distribution of robbery (cars, flats), but there can be found a relation between spatial characteristics of low intelligibility and low integration values and the perception of insecurity registered by questionnaires (mean perception of security counted for smaller groups of buildings and related to integration values). This perception is accompanied by the intensification of certain pathological incidents. The inhabitants of case B reported more anti-social incidents in their questionnaires in comparison to results from area A (e.g. assaults and battery, aggressive and antisocial behaviour).

The way inhabitants comprehend and relate themselves to the surrounding space influences the way they feel: safe or unsafe. It is important to underline the role of configuration of space in providing good living conditions as a basis for safety: 1) the more internally coherent the form is the better living conditions for inhabitants are created: the more intelligible structures the more predictable movement patterns; 2) there is a relation between spatial configuration and the perception of insecurity as unintelligible surrounding creates “better” environment for certain pathological events/incidents (e.g. assaults and battery, aggressive and antisocial behaviour): the less intelligible the space is the more dangerous it seems.

CPTED literature - Crime Prevention through Environmental Design (Colquhoun 2004) - based on Newman's concept of 'defensible space' (Newman 1972) emphasises the role of territorial markers as fundamental for discouraging potential crime incidents. Earlier research casted doubt on the concept 'defensible space' (Shu 1999, Hillier, Shu 1999) as this approach reduces through movement and therefore enhances segregation as well as reduces levels of activity. Furthermore, the concept of defensible space cannot shed light on the problem of crime prevention in areas of large modernist housing estates where most of the area is public - and therefore anonymous - space cannot be seen as someone's territory even in a symbolic way. At the same time unattractive architecture fail to work out meaningful language of forms recognizable by inhabitants. Intelligible spatial structure and its logic associated with dense patterns of space use offers an alternative approach to provide safety in housing estates. These aspects, however, are not com-

monly recognized. Sadly enough directives from CEN (Committee for European Standardisation) from 2002 "Prevention of crime – Urban Planning and Design" do not mention the issue of intelligibility of spatial form, rather paying attention to notions of visibility, accessibility, territoriality and durability (Colquhoun 2004).

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