Improving perceived safety through spatial design in Pendrecht

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STRUCTURE

1 / Problem introduction & analysis
2 / Inquiry (theory and data)
3 / Design principles
4 / The experiment
5 / Neighborhood transformation design
MOTIVATION

Growing population in cities

Densifying the existing urban environment

Maintaining the quality of life

QUALITY OF LIFE

- Livability
- Sustainability
- Society
- Safety
SAFETY

OBJECTIVE & SUBJECTIVE

EXPRESSED IN NUMBERS AND CAN BE MEASURED  BASED ON THE PERCEPTION OF SAFETY
CONCEPTUAL FRAMEWORK

Social Environment + Physical Environment = Perceived Safety

Social Environment:
- Socio-economic characteristics
- Demographics
- Social interaction
- Social integration

Physical Environment:
- Typomorphology
- Density
- Public spaces
- Infrastructure
- Land use

Outcome:
- Social Sustainability
- Safe environments
- Control
PROJECT LOCATION

Municipal location

Rotterdam-Zuid

Neighborhood location

Urban plan Pendrecht, by Lotte Starm-Beese (1949)

source: www.metalocus.es
PROBLEM INTRODUCTION

Problem neighborhoods in Rotterdam-Zuid

List and map of problem neighborhoods in the Netherlands (source: Ministerie van VROM)
Income deviation from the average of Rotterdam

Percentage of social housing

Percentage of population with a non-western migration background

Pendrecht
NEIGHBORHOOD PROFILE
NEIGHBORHOOD PROFILE

Unsafe (red) vs. Safe (green) in Pendrecht:

- **Safety Index:** Key indicators include theft, violence, and vandalism.
- **Physical Index:** Focuses on environment, facilities, and public space.
- **Social Index:** Borrows from the UN’s concept of ‘peace and security’.

Colors indicate:
- Red: far under the average of Rotterdam
- Pink: under the average of Rotterdam
- Grey: around the average of Rotterdam
- Green: above the average of Rotterdam
- Black: far above the average of Rotterdam

Diagram sources: Gemeente Rotterdam; OBI, Wijkprofiel 2020 (edited by author).
RESEARCH QUESTION

How can perceived safety be improved through neighborhood transformation in Pendrecht?
RESEARCH APPROACH

Inquiry
- Theory review
- Data collection
- Socio-economic characteristics
- Spatial characteristics

Problem area(s)

Design 1
- Design principles

Research
- Stated choice experiment to measure and validate design principles

Design 2
- Neighborhood transformation design

Reflection
THEORETICAL FRAMEWORK

CPTED
Assumes that crime and insecurity can be combatted through environment-oriented physical and social measures

SOCIAL SAFE DESIGN
Assumes that a social safe environment is an environment in which people can move freely from the threat of or confrontation with violence.
GUIDELINES FOR SOCIAL SAFE DESIGN

• Visibility
• Legibility
• Accessibility
• Attractiveness
GUIDELINES FOR SOCIAL SAFE DESIGN

- Visibility  →  Clear overview
- Legibility  →  Sightlines
- Accessibility  →  Lighting
- Attractiveness  →  Social control
GUIDELINES FOR SOCIAL SAFE DESIGN

- Visibility
  - Legibility: Clear borders between territories
- Accessibility
  - Attractiveness: Recognizable ownership over the space
  - Continuity of the urban fabric
GUIDELINES FOR SOCIAL SAFE DESIGN

• Visibility
• Legibility
• Accessibility
  Accessible for everybody
• Attractiveness
  Alternative routes
GUIDELINES FOR SOCIAL SAFE DESIGN

• Visibility
• Legibility
• Accessibility
• Attractiveness

→ Quality of experience

Maintainance of public space and buildings
Esthetic quality
SPATIAL ANALYSIS

- Modernist neighborhood
- Light, air, space principles
- Open building blocks
- Variation in building height
- Open green spaces
- Cars dominate the streets

Source: Author, 2019
ISSUES MENTIONED BY THE PARTICIPANTS

- Nuisance from waste
- Plein 1953 is unsafe during the night
- Route from metro station to main square is unsafe during the night
- Poor maintenance of the buildings
- Loitering groups

POSITIVE POINTS MENTIONED BY THE PARTICIPANTS

- Proximity of shops
- Proximity of public green
- Openness of the neighborhood
- The people: interaction and diversity
- Residents’ initiatives
DESIGN PRINCIPLES

1 / Spatial diversity
2 / Adding front doors
3 / Adding front gardens
4 / Define territories
5 / Creating alternative routes
OPEN GREEN SPACE

Source: Funda

Source: Google Maps
PARALLEL SHORT BUILDING BLOCKS
LONG BUILDING BLOCKS
DESIGN PRINCIPLES

Common building configuration in Pendrecht

Specific location in Pendrecht

Alley houses

Apartment buildings

Public greenery

Long building

Public square
1 / ALLEY HOUSES

1. Current Situation
- narrow alley bordered by backyard fences and building facade.
- no inter-visibility of front doors.
- blind walls along the street.

2. Rotate building block
- rotate building blocks to create inter-visibility of front doors.
- create communal street to increase social control.
- add front gardens.

3. Increase continuity
- increase diversity of the architecture.
- parking solution.
- adding green to the street.

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2 / APARTMENT BUILDINGS

1. Current Situation

- Low density of front doors along the streets
- Wide street profile with a lot of space for car parking
- Blind walls
- Entrances to the apartments not along the street

2. Add Front doors

- Adding front doors to the street to create inter-visibility and social control
- Physical border to increase legibility
- Small front gardens to create transition between public and private
- Entrances on the end of the building
3 / PUBLIC GREENERY

1. Current Situation

- blind walls
- public greenery
- ill defined territories

2. Adding a function to the public space

- adding an entrance to the short side of the building
- adding a playground to the public space
- adding frontdoors
- physical borders

adding a playground
4 / LONG BUILDING

1. Current Situation

- 200 meter long building
- Elevated underpass
- Public green with canal without recreational use
- Wide street profile with separated traffic and parallel parking

2. Split up the long building

- Splitting the long building block in shorter buildings
- Replacing a shorter building block with a new building
- Creating an attractive pedestrian path along the canal
5 / PUBLIC SQUARE

1. Current Situation

- apartments are located on the first floor
- the ground floor contains shops
- blind walls

2. Improve public square

- adding floors to the buildings around the public square
- paths that create the routes across the square
- facilitate places to sit
- adding green to the square
SELECTED DESIGN PRINCIPLES

1. Adding front gardens
2. Increase continuity of building blocks
3. Adding front doors
4. Splitting long building blocks
5. Adding a path to an empty public space
6. Creating physical borders between territories
7. Adding building floors
STATED CHOICE EXPERIMENT

The stated choice methodology assumes that when people have choice between two alternatives, they will choose the option that yields them the highest level of happiness.

(Louviere et al., 2000; Hensher et al., 2005)
STATED CHOICE EXPERIMENT

AIM

Validate selected design principles that improve the perceived safety.

LAYOUT

Present a relatable narrative to the participants

“You have an appointment with someone at a location you have never been to. You have just got off the bus and walk into the neighborhood, but you are lost. The two streets shown below are the options you have to get to your destination, which option would you choose to arrive at the appointment while feeling safe?”

7 choice tasks

1. Adding front gardens
2. Increase continuity of building blocks
3. Adding front doors
4. Splitting long building blocks
5. Adding a path to an empty public space
6. Creating physical borders between territories
7. Adding building floors

SAMPLE

344 participants who are not residents of the neighborhood (to avoid familiarity with the environment)
Q1 / Adding front gardens

Hypothesis:
The participants prefer the situation in which the front gardens have been added.

Theory:
Front gardens make a street more attractive, lively, and softens the transition between public and private.
Q2 / Increase continuity of building blocks

Hypothesis:
The participants prefer the situation in which the building blocks are rotated.

Theory:
By rotating the building blocks there are more front doors on the street and there is a higher intervisibility between the front doors, which increases the social control.
Q3 / Adding front doors

Hypothesis:
The participants prefer the situation with the added front doors.

Theory:
By adding front doors the street becomes more lively and there are more direct physical connections between the dwelling and the street, which increases the social control.

Preference results added front doors

- Current situation: 21%
- Adding front doors: 79%
Q4 / Split long building

Hypothesis:

The participants prefer the situation where the building is split in two shorter buildings

Theory:

Splitting the building creates an alternative route, which gives the observer the opportunity to avoid unwanted situations ahead. The alternative route is well lit, which reduces the chance of unwanted behavior.
Q5 / Adding a path to an empty public space

Hypothesis:
The participants prefer to continue walking on the sidewalk

Theory:
The path that runs through the park is less well lit than the sidewalk. People can not see what is happening in the park, the reduces the perceived safety. In addition, surrounding residents also can not see what is happening in the park, as a results the social control is low.
Q6 / Creating physical borders

Hypothesis:
The participant prefer the situation in which the hedge (a physical border) is added.

Theory:
By adding a physical border between territories the area becomes more legible and because the border is a hedge it also adds to the attractiveness of the street. Furthermore, an open field of grass can feel unsafe in the dark.
Q7 / Adding building floors

Hypothesis:

The participant prefer the situation where floors are added to the current buildings.

Theory:

By adding floors to the existing buildings there are more windows, and therefore eyes, directed to the public space. Eyes on the public space increases the social control.
EXPERIMENT RESULTS

Reject the null-hypothesis

H₀: There is no significant difference between the distributions.

H₁: There is a significant difference between the distributions.

Binomial Test

- Indicates whether or not there is a significant difference in the distribution of observations.
- Assumes a 50/50 distribution (in table Test. Prop.)
- Significant when p-value < 0.05 (in table Exact Sig. (2-tailed))

Conclusion

There is a difference in perceived safety between the two situations.
NEIGHBORHOOD TRANSFORMATION DESIGN

HOW CAN PERCEIVED SAFETY BE IMPROVED THROUGH NEIGHBORHOOD TRANSFORMATION IN PENDRECHT?
VISION

MAIN DESIGN PRINCIPLES

1 / Optimize front door intervisibility
2 / Optimize front door density
3 / Add front gardens where possible
4 / Diversify the architecture and dwelling types
5 / Physical borders between territories
6 / Maintain public green/blue structure
7 / Increase the sense of community
Total number of dwellings included in masterplan: 1,356 dwellings

- **urban living**
  - Number of dwellings: 730
  - Density: 138 dwellings per hectare

- **collective living**
  - Number of dwellings: 440
  - Density: 109 dwellings per hectare

- **family living**
  - Number of dwellings: 186
  - Density: 77.5 dwellings per hectare
METRO STATION SQUARE
RESIDENTIAL STREET
COLLECTIVE GARDEN
URBAN LIVING

Local park  Collective space  Urban block  Urban boulevard  Accent building  Metro station square
Public street
Fenced of backyards
Shared entrances on the public side of the building
Collective garden seating area, flowerbeds and trees, places to play
Apartments adjacent to the collective garden for informal supervision
Apartments overlooking the public street and the collective garden with balconies for informal supervision
Hedge defining the collective garden
Fenced of backyards

SAFETY
LOCAL PARK
RESIDENTIAL STREET
COLLECTIVE SPACE
COLLECTIVE LIVING

- Collective garden
- Collective building blocks
- Local park
- Single family houses

Collective space
Collective garden
seating area
playground
flower beds
pedestrian paths

Front door and front
garden that overlook
the local park

Parking area for the
residents of the block

Hedges separate
the backyards of the
maisonettes

Backyards which function as transition zo-
nes between private and collective space

Local public park for the neigh-
borhood residents and visitors

Gallery to enter the maso-
nettes on the second floor

Underpass with shared
entrances to the upper
maisonette homes

SAFETY
RESIDENTIAL SQUARE
RESIDENTIAL STREET
COLLECTIVE GARDEN
FAMILY LIVING

Collective garden
Existing apartment building
Residential square
Single family houses

Collective space
The program of the garden will be determined by the residents.

Parking area for the residents of the block encourages encounters between neighbors.

Parallel parking in front of the houses.

Front gardens to encourage encounters between neighbors.

Collective garden

Single family houses

Existing apartment building with added doors to the collective garden.
CONCLUSION

HOW CAN PERCEIVED SAFETY BE IMPROVED THROUGH NEIGHBORHOOD TRANSFORMATION IN PENDECHT?

• Analyze the physical environment and spatial elements that have a negative effect on the perceived safety
• Develop design principles that aim to improve the perceived safety
• Validate the design principles through an experience based experiment
• Use the design principles as guidelines for the neighborhood transformation design
• And integrate the design principles in the neighborhood transformation design
THANK YOU FOR YOUR ATTENTION!