TOWARDS HEALTHFUL, AGEING-FRIENDLY & ENABLING DESIGN: A MULTI-SENSORIAL STUDY OF HOUSING NEIGHBOURHOODS IN SINGAPORE

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Project Title: Multi-Sensory Approach to Ageing-Friendly Design in High-Density Contexts [R-295-000-145-115]

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The most common initial response to a built environment is

**SENSORY EXPERIENCE**

- **EMOTIONAL**
- **MULTI-SENSORIAL**
SENsory experience

Stress is the major cause of diseases, pandemic depression and death in the developed world. (WHO, 2002)
“The inhumanity of contemporary architecture and cities can be understood as the consequence of the negligence of the body and the senses, and an imbalance in our sensory system.”

(Pallasmaa, 1996)
The majority of people experience some degree of decline in sensory and cognitive capacity as a common consequence of ageing (Cacchione, 2014; Dillon et al., 2010).

- visual impairment
- hearing loss
- decline in motor functions
- ability to identify odours
Associated declines in sensory and cognitive functions with ageing
(Crews & Campbell, 2004; Humes et al., 2013)

Immense impacts on quality of life and almost all aspects of daily living of the older adults:

• mobility, navigation and spatial orientation (Haanes et al., 2014, 2015)
• increased falls and accidents (Lopez et al., 2011)
• communication difficulties (Heine & Browning, 2004)
• lower levels of independence and autonomy, social withdrawal (Andressen & Puggaard, 2008; Heine et al. 2013)
By 2050, elderly population in Asia will reach 23%.

In Singapore, population aged 65 and over:

13% in 2017
27% by 2030
47% by 2050

(Department of Singapore Statistics, 2017; Tan, 2017)
Ageing in place & Active ageing

- New housing schemes
- Neighbourhood upgrading programme
- Barrier-free design
- Employment possibilities
- Care and social facilities and programmes
- Life-long learning programmes

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Making S’pore a more elder-friendly place

Experts discuss issues like living environment, income and attitudes

By SALMA KHALIK

Ramiha for Health and Manpower set the tone by saying “We should not see ageing as a problem”. She identified the “4Ps” of Singapore will need to cater to its rapidly ageing population: philosophy, physical environment, policies and people. On philosophy, she said: “What underpins our conversations must be a set of values and beliefs about the kind of society which our seniors, and in fact we ourselves in the future, will live in.”

“VALUES AND BELIEFS

What underpins our conversations must be a set of values and beliefs about the kind of society which our seniors, and in fact we ourselves in the future, will live in.”

Dr Amy Khor, Minister of State for Health and Manpower

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SINGAPORE EHD 2019: TOWARDS HEALTHFUL, AGEING-FRIENDLY & ENABLING DESIGN
Ageing in place

Family has traditionally been the main source of support for the elderly in Asia.

However, there has been a rising trend of more elderly people living alone expected to reach 92,000 by 2030 (CAI 2006)
Need for more integrated and supportive design

Factors in creating an elderly-friendly environment:

- Physical Integration
  - Connectivity
  - Transport and pedestrian networks

- Functional Integration
  - Mixed use, shared use, co-location
  - Programmatic hybridity

- Social Integration
  - Intergenerational spaces
  - Creating spaces that are not age-segregated

• physical
• mental
• emotional
• social needs
“Sensory Revolution”

Since early 2000s

Renewed interest in sensory studies:
- Social sciences
- Human geography
- Sensory Ethnography
- Anthropology
- Environmental Psychology
- Neuroscience

+ technological advancement

Translation of such new knowledge into design is a challenge.
To discuss the role of multi-sensory approach to planning and design of ageing-friendly neighbourhoods and outline a study conducted in two housing neighbourhoods in Singapore, which aimed to:

- **document and assess the multi-sensory qualities** of the local high-density neighbourhoods
- **develop an integrated multi-sensory analysis framework** to investigate the multi-sensory capacities of local neighbourhoods to enable more meaningful and joyful “ageing in place” and “active ageing” and foster higher sense of physical, mental and social well-being for all ages
More than 80% of Singaporeans live in HDB neighbourhoods, 2017
SCOPE

SITE 1: BUKIT PANJANG (1980s)

SITE 2: CASA CLEMENTI (2013)
PILOT STUDY

EXPLORATORY EXERCISES TO CAPTURE & MEASURE SUBJECTIVE SENSORY EXPERIENCE
with 30 architecture and urban design students

Guy Debord, "Dérive" (1994)
Walter Benjamin, “Flâneur” (1999)

- Workshops:
  - Multi-sensory photo-journeys
  - Sensory notation and evaluation
  - Movement notation
- Snapshot activity analysis
- Rhythmanalysis
- Role-playing
- Perception surveys
- Walk-along interviews

Rhythmanalysis (Lefebvre, 2004)
PILOT STUDY

SITE 2: CASA CLEMENTI

PHOTO-JOURNEYS – SENSING THE SITE

• capture the **first impression** about the neighbourhood
• Initiate the discussion on **subjectivity** of experience
• Explore the capacities of photo-taking as means for capturing **sensorial narratives and rhythms**

Smellscape (Courtesy of Ge Fan Li, Naitik Parekh, Nurzhanat Kenenov, Phuah Lin and Ulrich Chia)

Traces of everyday-ness (Courtesy of Sun Yutong)
PILOT STUDY
SITE 2: CASA CLEMENTI

SENSORY NOTATIONS AND RHYTHMS

Sensory notation system
(Lucas & Romice, 2008)

(Courtesy of See Ying Jia)
TRACING PEDESTRIAN ACTIVITY RHYTHMS
Where do people move and stay?

Snapshot method
(Gehl & Svarre, 2013)

(Courtesy of Kuldeep Rabha, Mehnaj Tabassum, Li Jinyi and Nandita Nayak)
PILOT STUDY

SITE 2: CASA CLEMENTI

SYNTHESIS: Rhythmanalysis

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Key topics that arose from the study:

- safety and wayfinding
- thresholds and universal design
- integrated public amenities
- social interaction and inter-generational design
- inclusive vs. exclusive environment (ageism)
- emotional landscapes
- responsive environment and smart technologies

This shows the capacity of multi-sensory analysis to capture critical issues pertinent to ageing-friendly design and indicate certain design measures.
PILOT STUDY  SITE 2: CASA CLEMENTI

Design Response
Wayfinding & dementia

• associative clues
PILOT STUDY  SITE 1: BUKIT PANJANG

Design Response

Inter-generational sensory plaza
PILOT STUDY  SITE 1: BUKIT PANJANG

Design Response
Augmented space & responsive design

(Courtesy of Shivank Singhal)
APPROACH & METHODS

FINAL STUDY

- Quantitative sensory data documentation
- On-site observation and mapping of pedestrian activities
  - Socio-perceptual surveys
  - Eye-tracking journeys and interviews

• SYNTHESIS: INTEGRATED MULTI-SENSORY FRAMEWORK
**FINAL STUDY**

**Socio-perceptual survey** (key preliminary findings)

**BUKIT PANJANG: 235**

Profile

Reported Sensory Impairment

AGE CLASSIFICATION:

- **ADULT (18-49)**
- **OLDISH (50-64)**
- **YOUNG-OLD (65-74)**
- **OLD (75-82)**
- **OLDEST-OLD (83+)**
- Missing Data

(Bozovic-Stamenovic, 2013)
**Socio-perceptual survey** (key preliminary findings)

**FINAL STUDY**

- **85.02%**
  - **NATURE** makes walking through this neighbourhood more enjoyable

- **79.16%**
  - This neighbourhood is overall aesthetically appealing

- **57.89%**
  - I always prefer walking on **sHELTERED PATHWAYS** (covered walkways and void-decks)
FINAL STUDY

Socio-perceptual survey (key preliminary findings)

There are plenty of opportunities for different generations (e.g. children and elderly) to meet.
FINAL STUDY  Socio-perceptual survey (key preliminary findings)

THIS NEIGHBOURHOOD IS OVERALL WELL-DESIGNED FOR THE ELDERLY USERS

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77.00 %
How often do you go out of your home into your neighbourhood?

**Bukit Panjang:** 235

- Few times every month: 3.02%
- Few times every week: 14.66%
- Once a day: 27.59%
- 2-3 times a day: 36.64%
- More than 3 times per day: 18.10%
Socio-perceptual survey (key preliminary findings)

- This neighbourhood is often too crowded: 37.67%
- I often find spaces around my home quite noisy: 24.43%

Final Study
Socio-perceptual survey (key preliminary findings)

Spaces around my home are dirty and messy

I often find places around my home smelly

8.75%

13.42%
AVOID PASSING BY RUBBISH CHUTES, MESSY AREAS AND DARK PLACES
FLOORS IN THIS NEIGHBOURHOOD ARE **SLIPPERY** WHEN IT RAINS AND I FEEL **UNSAFE** TO WALK

THERE ARE **MANY OBSTACLES** TO WALK AROUND THIS NEIGHBOURHOOD

**34.29 %**

**30.55 %**

FINAL STUDY  
Socio-perceptual survey (key preliminary findings)
FINAL STUDY

Socio-perceptual survey (key preliminary findings)

I HESITATE TO GO OUT IF THERE IS NO ONE ACCOMPANYING OR HELPING ME

SOMETIMES, I CAN'T FIND MY WAY IN THIS NEIGHBOURHOOD

10.68%

12.81%
FINAL STUDY

SITE 1: BUKIT PANJANG

Eye-tracking [sample size: 60]

Spontaneous daily routine walks (15-30mins)
SITE 1: BUKIT PANJANG

Eye-tracking [sample size: 60]

FINAL STUDY

ADULT (18-49) | 3
OLDISH (50-64) | 32
YOUNG-OLD (65-74) | 17
OLD (75-82) | 7
OLDEST-OLD (83+) | 1
Eye-tracking documentation

SINGLE JOURNEY

- Participant’s profile
- Plotted path
- PATH
- EYE-FIXATION BAR
- VIDEO
- TIME
- Walking speed
- Sensory narratives
SYNTHESIS: INTEGRATED MULTI-SENSORY FRAMEWORK

MEASURED "QUANTITATIVE" DATA
- MEASURED SENSORY DATA
- REPORTED SUBJECTIVE SENSORY DATA
- PEDESTRIAN ACTIVITY

JOURNEY
- PATH & DISTANCE
- TIME

EXPERIENTIAL DATA
- EYE-TRACKING VIDEO DATA
- VISUAL REFERENCE
- QUALITATIVE MULTI-SENSORY DATA (walk-along and post-walk interviews)

MULTI-FUNCTIONAL METER DATA:
- Sound (Db); Humidity (%); Light (Lux); Temperature (°C)

INTENSITY & COMFORT/PLEASURE:
- Sensory Sliders & Notation Charts
- Experience Keywords

PEDESTRIAN COUNTS:
- Transient Activity
- Stationary Activity
- Average Walking Speed (km/h)

"BARCODE" - EYE FIXATION ANALYSIS:
- VISUAL REGION (ground, sky, edges)
- OBJECTS & SURFACES (fixed)
- TEMPORARY EVENTS (people, moving objects)
- Heatmaps

- Sound
- Tactile
- Olfactory
- Kinaesthetic Experience
- Atmosphere
- Aesthetic & Comfort Judgment
- Emotional Response
Eye-fixations - visual regions

Visual attention of older adults tend to be focused on the ground, due to the safety concerns and possibly the body posture.

I have to be extra careful, my daughter-in-law told me to be careful and made me wear an amulet to keep me balanced, not topple. Falling down is a very issue for old. (Ms Lim)

I will not walk here in a rainy day as it is very slippery. (Mr Wong)
Market and open plaza

Sensory rich
Engaging
Edges
Crowded
Colourful
Social interaction

Void-deck
Sensory poor
Disengaging
Ground
Empty
Monotonous
Social interaction
Looking at plants makes my mood better. Sometimes the flowers change colour. When we noticed that, we will think to ourselves: “Look at that! What a surprise!” If there’s something growing, I will feel happy. (Sam)

I often come here and watch people grow plants. (…) I used to live in “kampong” [village]. My mom would grow vegetables, rear pig, chickens. (Lynn)
Creating health-supportive and ageing-friendly environments goes beyond passive and non-integrated provision of healthcare and eldercare facilities, universal design, hygiene and safety. Instead, subjective multi-sensorial experience, overall ambience and culture-specific clues (among others) become the agenda for age-sensitive neighbourhood design. Housing neighbourhoods are seen as supportive “devices” with capacities to build up residents’ physical and mental ability levels, independence and social support, sense of dignity and self-esteem, at different stages of ageing.
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