Down memory lane: Eliciting affective geographies and sites of memory through participatory mobile biosensing. The UrBio experimental project.

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EXPL/GES-URB/0273/2021

UrBio

Making urban planning and design smarter with participatory mobile biosensing

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THE OBJECTIVE OF THIS EXPLORATORY PROJECT (1 ½ years) is to develop and test inclusive and participatory mixed methodologies that use biosensor data to plan and design healthy, convivial, and sustainable tourism, consumption and leisure areas.

Types of Biosensing

Electrodermal Activity (EDA)

- Electrical phenomena in skin, including all active and passive electrical properties which can be traced back to the skin and its appendages. (Boucsein, 2012, p. 2).
- It has been used as an indicator of emotional arousal.

Electroencephalogram (EEG)

- Records the electrical signals produced by the various regions of the brain.
- It has been used to identify emotions in real time (Aspinall et al., 2015).

Cortisol Level

- Cortisol is a hormone which is produced by the body in response to stress. It can be found in the saliva.
- Salivary cortisol is used as a biomarker for variation in stress levels (Thompson et al., 2012).

Eye-Tracking

- Eye-tracking records the gaze of an individual in a given environment.
- Eye-tracking has been used to understand which spatial features capture the attention of individuals (Hollander et al., 2019).

functional Magnetic Resonance Imaging (fMRI)

- Measures brain activity by detecting bloodflow.
- It has been used to study environmental imagery, virtual reality , or in post-hoc studies (Reichert et al., 2018).

Mobile Ecological Context

Static Laboratory Context

Advantages of Biosensing

Biosensors are considered more objective than self-reported assessments, which tend to be biased.

Wearables allow for continuous measurement at a high temporal resolution.

Wearables significantly reduce the burden on participants, who are not required to repeatedly complete surveys.

Ambulatory measurements facilitate the investigation of people's physiological signals during their daily routines in real-life situations, offering greater ecological validity than lab studies.

(Birenboim et al., 2019)

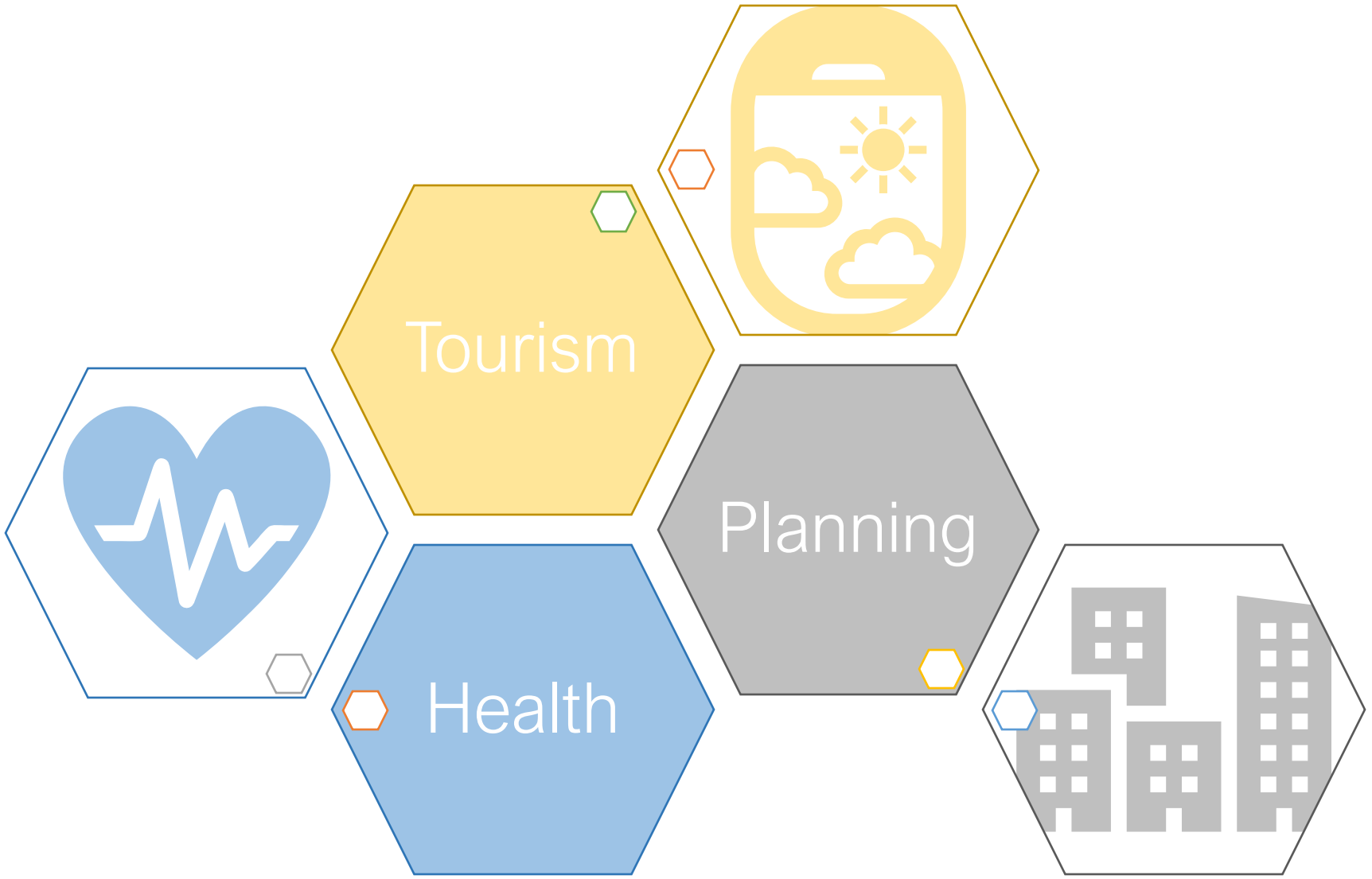
Limitations

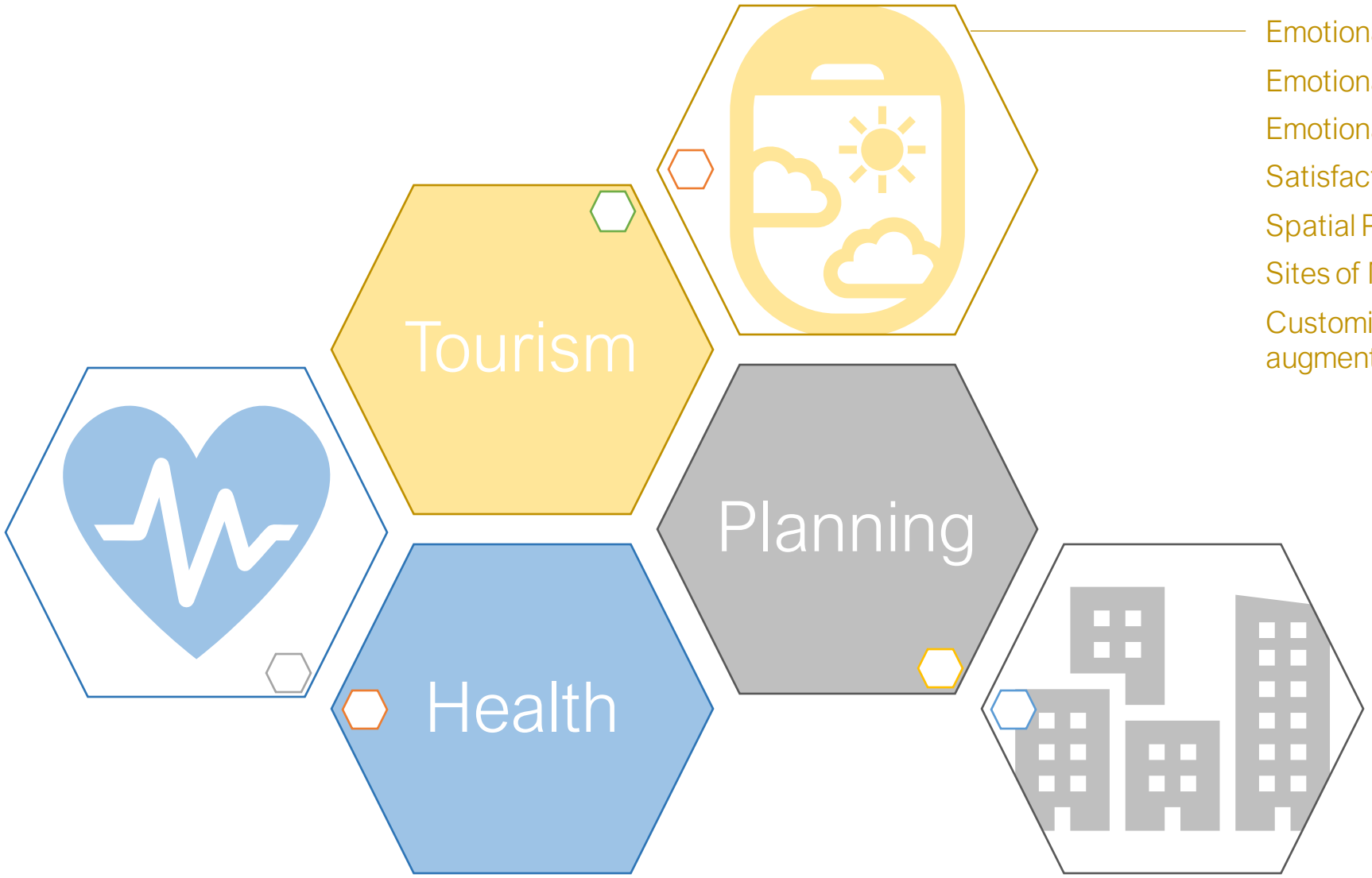
Objectivity

- Biosensing data cannot be assigned to a certain event unambiguously (Shoval et al., 2017; Reif & Schmücker, 2021)
- Biosensors might not detect low-intensity changes or be sensitive to differing cultural understandings of emotions (Pykett et al., 2020)
- Biosensing can capture the ‘what’ but not the ‘why’ (Osborne & Jones, 2017)
- Physical activity influences biosensor data (Pykett et al., 2020; Reif & Schmücker, 2021)
- Difficulties in standardization (Shoval et al., 2017)

Non-interference

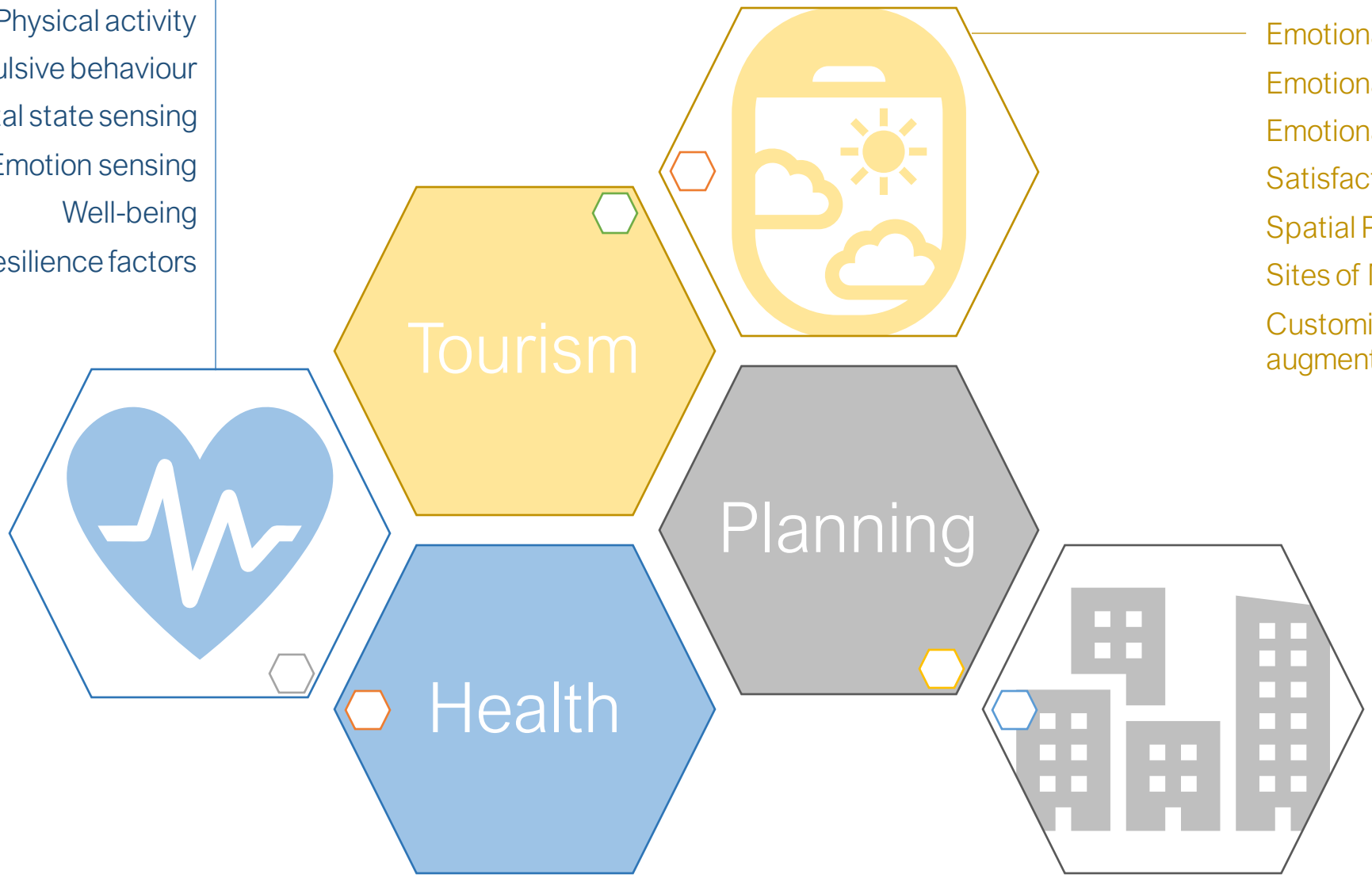
- The use of biosensor equipment can be understood as very invasive (Reif & Schmücker, 2021).


Tourism
Planning
Health



- Emotional measurement
- Emotional engagement
- Emotional responses
- Satisfaction
- Spatial Points of Emotion
- Sites of Memory
- Customization and augmentation of experiences

Stress
Physical activity
Compulsive behaviour
Mental state sensing
Emotion sensing
Well-being
Risk and resilience factors



Emotional measurement
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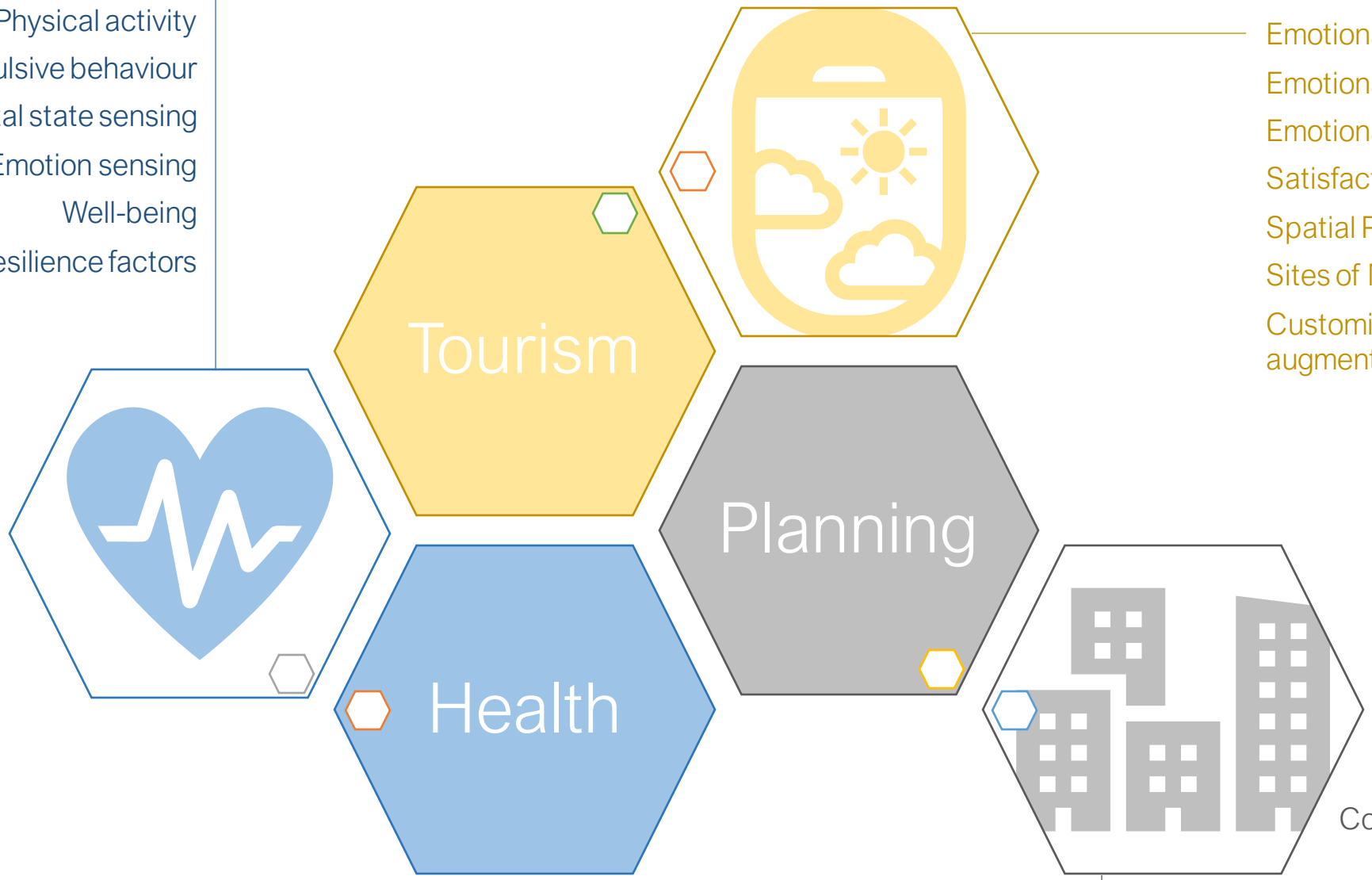
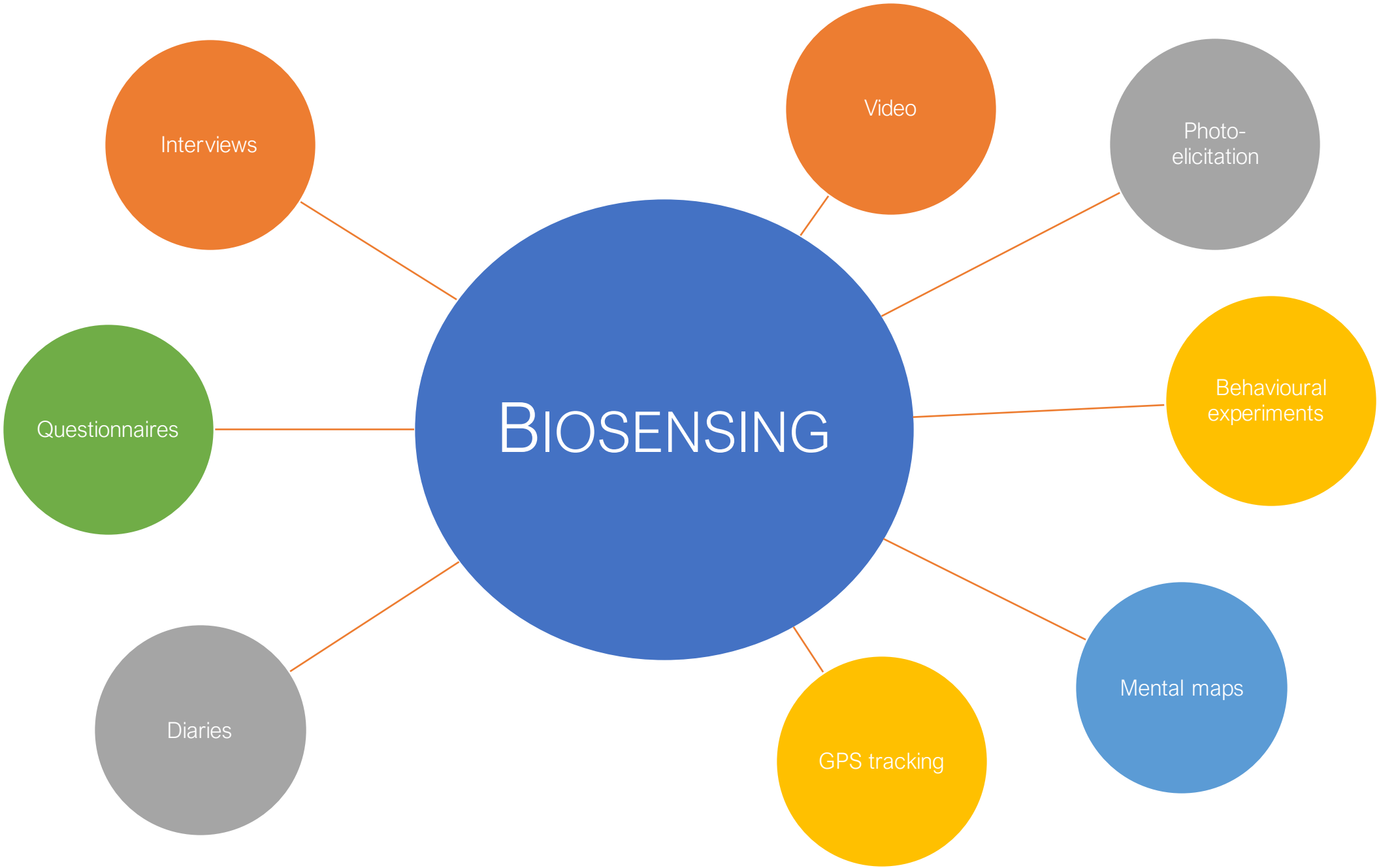


Emotional measurement
Emotional engagement
Emotional responses
Satisfaction
Spatial Points of Emotion
Sites of Memory
Customization and augmentation of experiences

Urban analysis
Urban emotions
Cognitive responses
Communicating experience
City well-being
Urban Design

“A key takeaway from this is that using additional data sources and combined qualitative methods is fundamentally important for an in-depth understanding of the valence of the tourist emotions measured using biosensing” (Reif & Schmücker, 2021, p. 282)


Interviews
Video
Photo-elicitation
Questionnaires
BIOSENSING
Behavioural experiments
Diaries
GPS tracking
Mental maps

UrBio

Thus far, biosensors have been mostly used in urban studies to achieve better accuracy on the emotions that public space elicit on urban dwellers.

UrBio aims at including citizens in the research process and use biosensor data to allow them to reflect and express the impact of the urban environment on their everyday experiences.

Our research questions 

1. How are biosensing technologies currently being used by citizens, and what will be the impact of the new generation of wearable biosensors in everyday life?
jan. – mar. 2022

2. How can wearable biosensor's data be used to enhance qualitative research on the experience of urban affective atmospheres?
abr. – dez. 2022

3. How can biosensor data be used to make urban planning and design more participatory?
jan. – jun. 2023

Our tasks 

1. Exploratory research on biosensors in everyday urban life
   - Training workshop with postgraduate students
   - Biosensor tests
2. Biosensing the city: Transect walks
3. Biosensing the city: Participatory mapping
4. Biosensing the city: Scenario-elicitation
5. Planning application: Pilot study

Research Contexts

Equipment

Empatica E4 Wristband

EDA (Electrodermal Activity) measures skin gland activity and can be used to measure the level of emotional arousal, i.e., EDA tells us how intensively we feel about places.

1

The Walk

Conditions

- Participants wear the Empatica E4 Wristband, which records their EDA data.
- They take a tablet with them, which displays real time EDA data.
- They are invited to take a look at the data display during their walk.

Instructions

- Participants must walk up and down the proposed path.
- Total walk time ranges from 15 to 30 minutes.

2

Interview Script

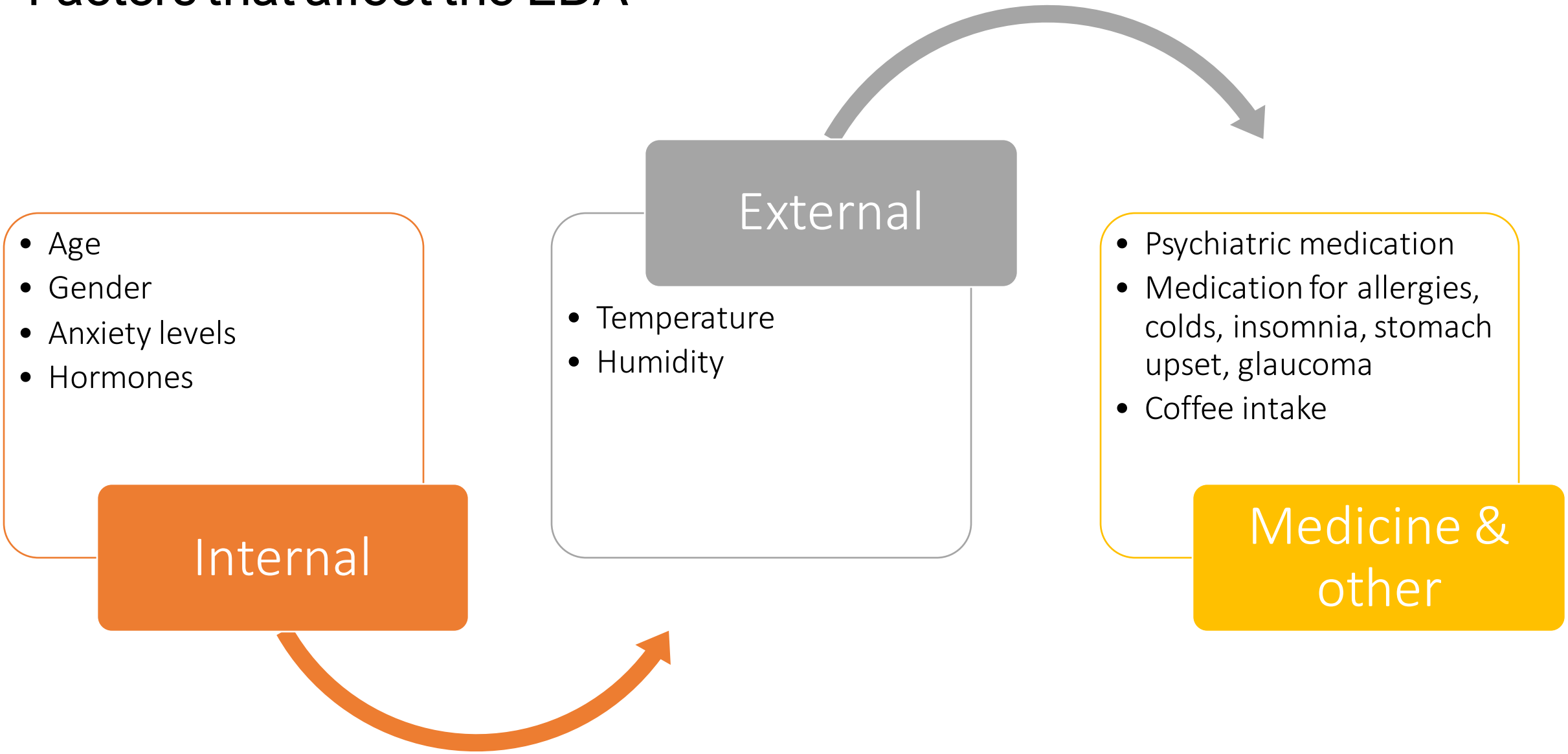
Part I _ The Walk

1. Can you describe your walk, the trajectory you did, and any stop you made?
2. What were the things that caught your ***attention***?
3. Was anything especially ***positive***? What kind of positive sensations or emotions did you feel?
4. Was anything especially ***negative***? What kind of negative sensations or emotions did you feel?
5. Did you see or hear anything that brought you any kind of affective ***memory***?

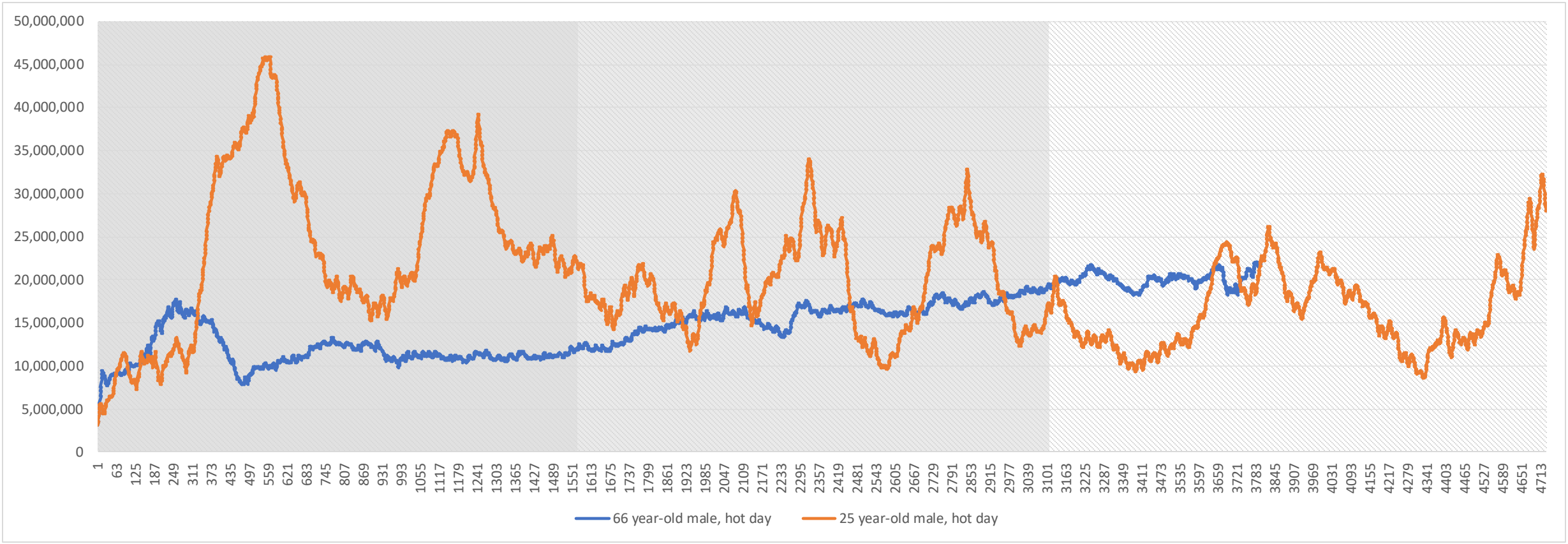
Part II _ The Data

1. Can you identify the phases of your walk in this graphic?
2. Can you identify the ***positive*** moments of your walk in this graphic?
3. Can you identify the ***negative*** moments of your walk in this graphic?
4. Can you identify the affective ***memories*** that came up during your walk in this graphic?
5. Do you feel that this data represents your physical and emotional state during the walk accurately?

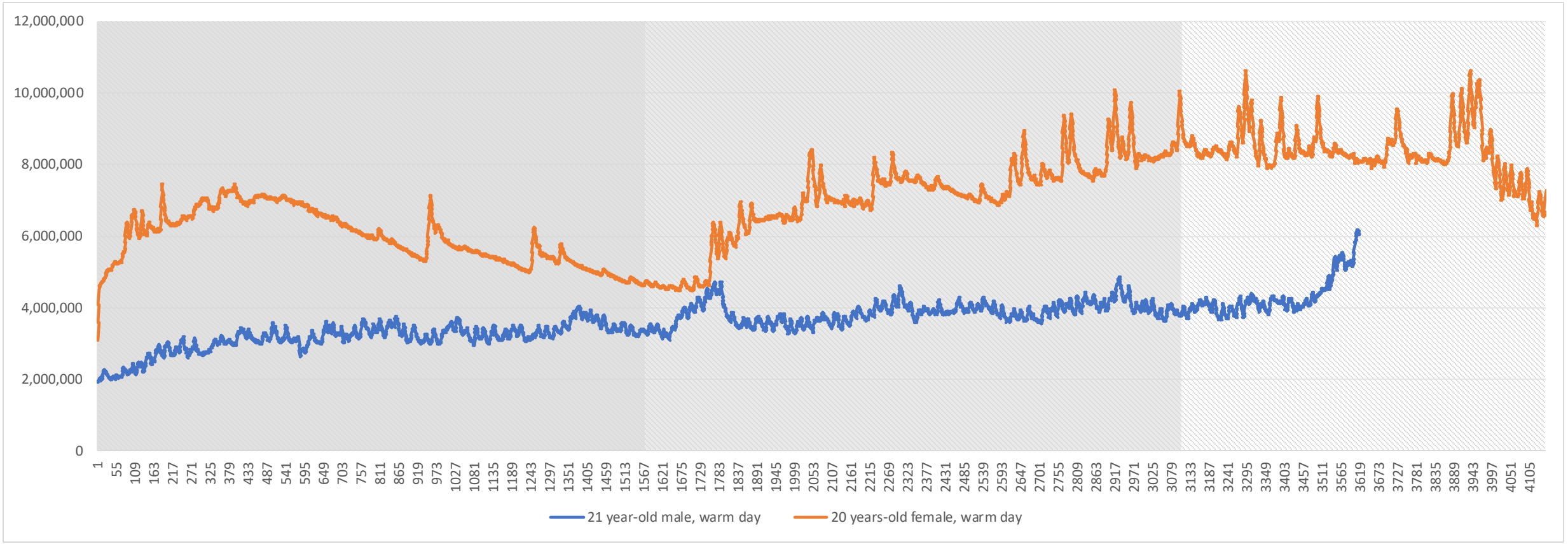
Factors that affect the EDA



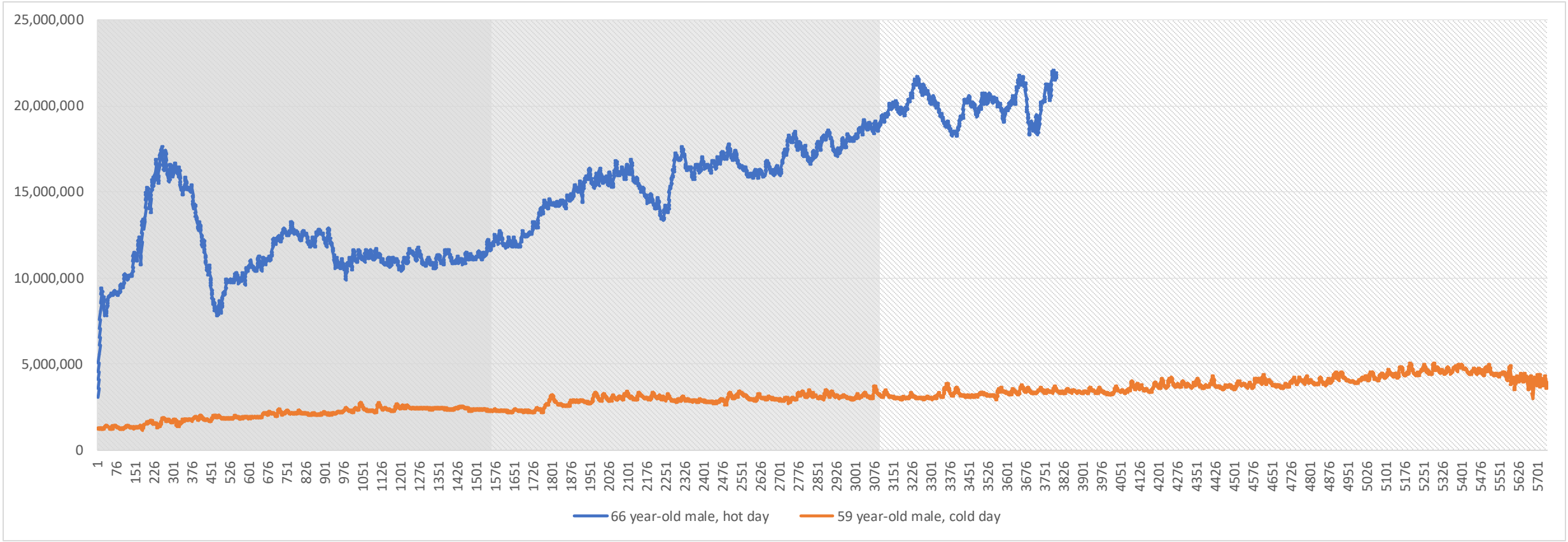
66 vs 25 year-old males, on a hot day



Young participants (20s) on a warm day, male vs female

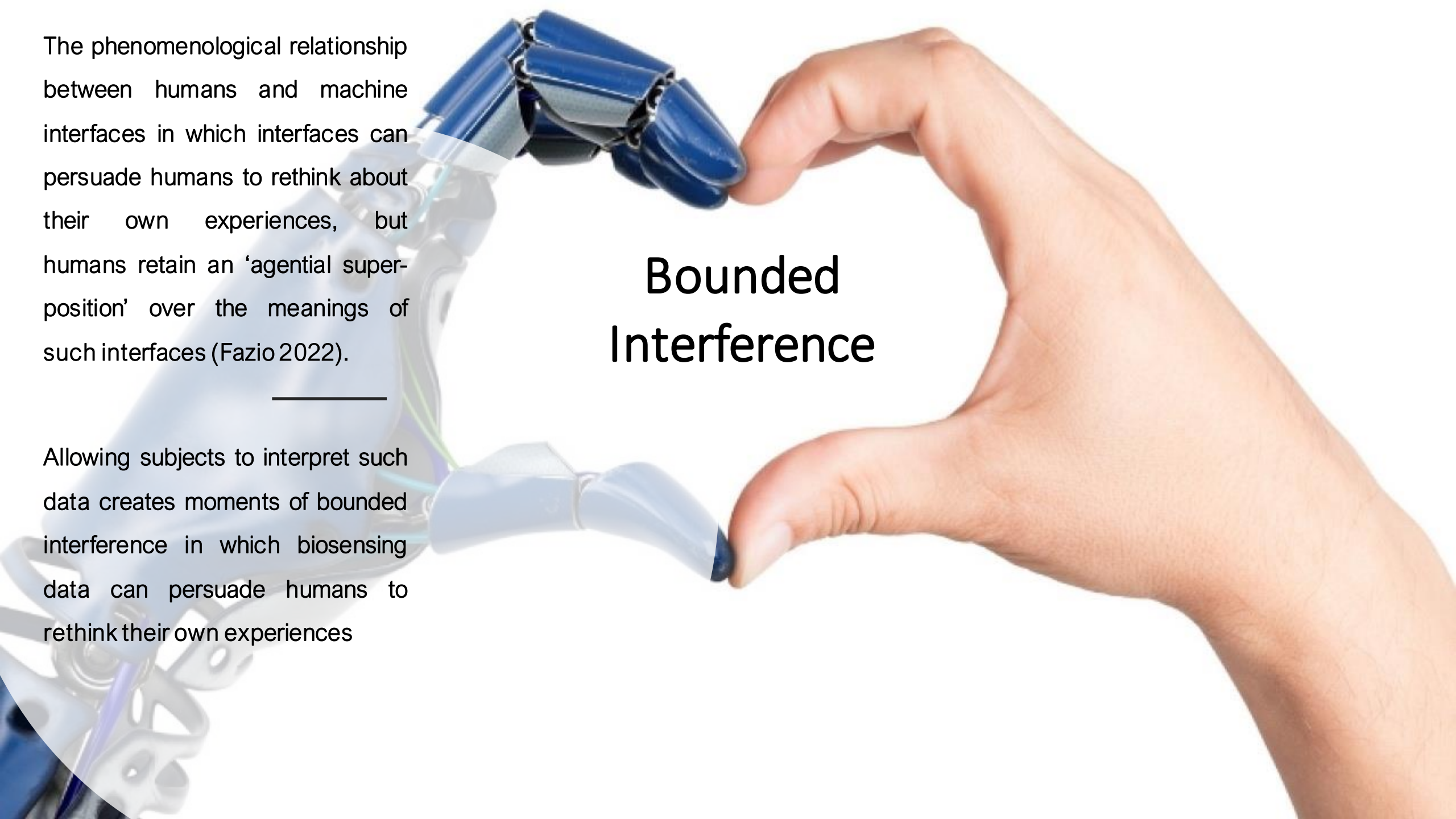


Older male participants (60s), hot vs cold day



The phenomenological relationship between humans and machine interfaces in which interfaces can persuade humans to rethink about their own experiences, but humans retain an ‘agential super-position’ over the meanings of such interfaces (Fazio 2022).

Allowing subjects to interpret such data creates moments of bounded interference in which biosensing data can persuade humans to rethink their own experiences

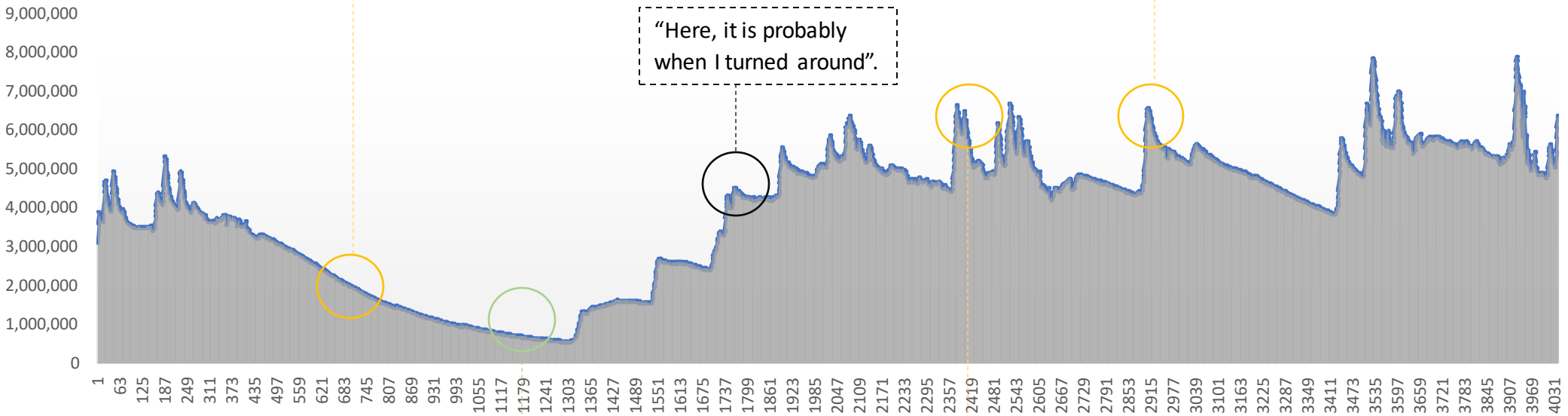


Participant in Lisbon

"The shop windows. A pharmacy window got my attention, with a series of creams and products. The clothing store windows as well. A restaurant that I had never seen also got my attention. I know the area, but I had not come here, at least on foot, for a while".

"Perhaps it's a stretch to say that this is an affective memory, but I actually passed by a Churrasqueira [grilled chicken take away restaurant], which I think have the best chicken in Lisbon. And as I passed by, it reminded me of my friends with whom I ate those chicken that last time".

"Here, it is probably when I turned around".



AGE	47
GENDER	FEMALE
TEMPERATURE (c)	23.8
HUMIDITY (%)	36
MEDICATION	NO
LOCAL	YES

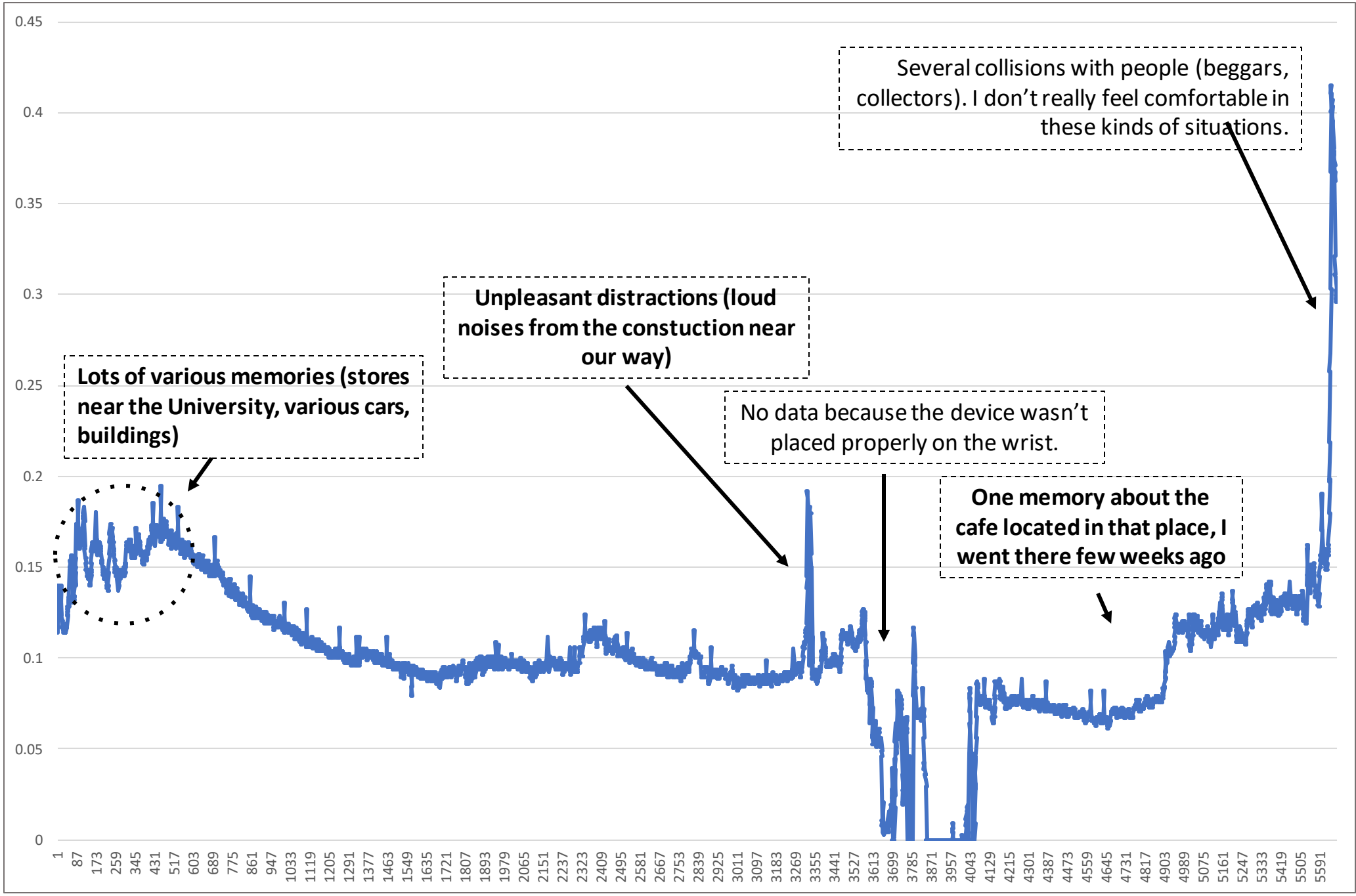
"It is curious that in this first half everything is more calm".

"It's not related to the street, I am not sure if this will make much sense for the study that you are doing. Because I am having some negative thoughts, nothing to do with the walk, it's my own stuff. And I felt that during the walk, because when a person winds down, it is easier to start thinking about stuff . I felt this in the second half. Because in the first half I was more distracted, with the shop windows and everything. In the second half, I was ruminating".

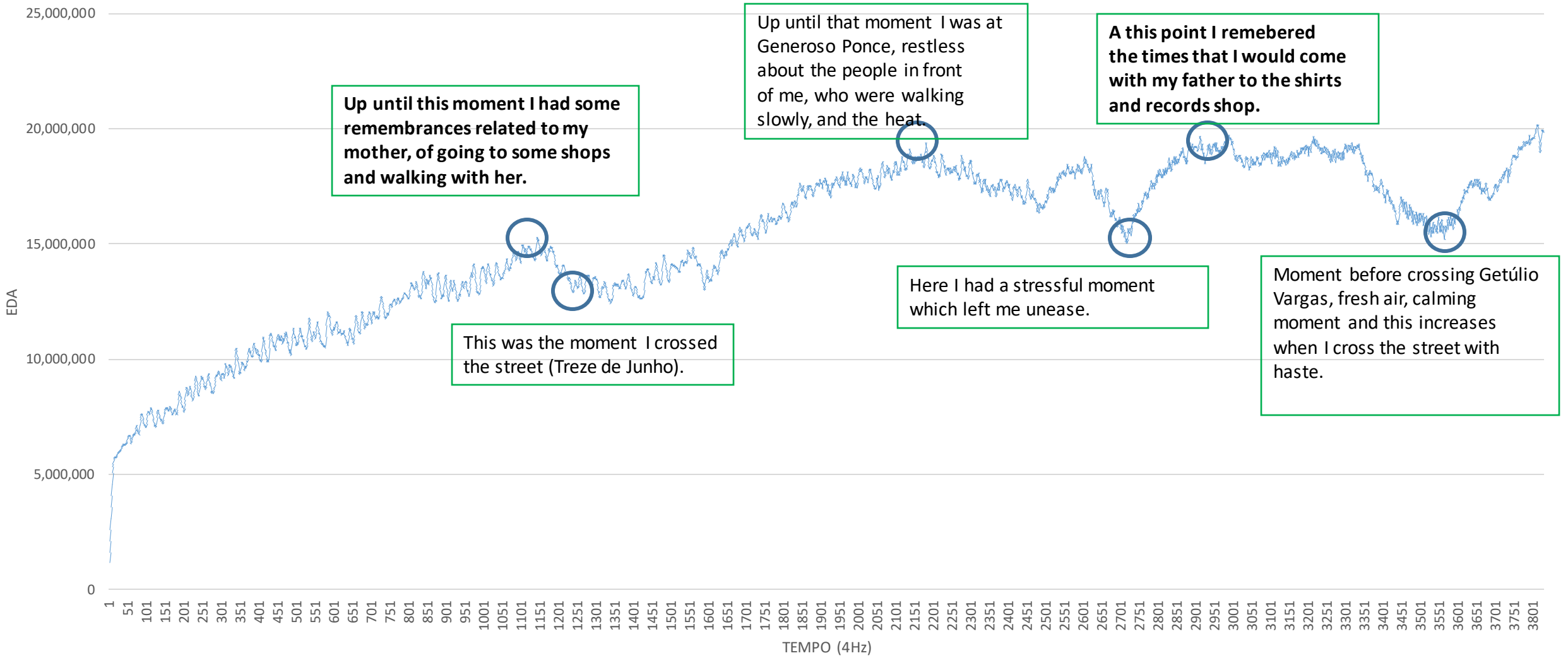
"This makes sense because when I went the first time, I was super-distracted with what I was seeing, and I was super calm, and then when I got back I was more involved in my own thoughts".

Participant in Warsaw

AGE	19
GENDER	FEMALE
TEMPERATURE	23˚C
HUMIDITY	50%
MEDICATION	NO
LOCAL	NO



Participant in Cuiabá



Up until this moment I had some remembrances related to my mother, of going to some shops and walking with her.

This was the moment I crossed the street (Treze de Junho).

Up until that moment I was at Generoso Ponce, restless about the people in front of me, who were walking slowly, and the heat.

Here I had a stressful moment which left me unease.

A this point I remebered the times that I would come with my father to the shirts and records shop.

Moment before crossing Getúlio Vargas, fresh air, calming moment and this increases when I cross the street with haste.

The beginning of the walk was really quiet until I crossed the street (Generoso Ponce).

I was slightly bothered during the walk until I accepted th situation and walked at my own rhythm.

The moment of stress was clear and then the moment of joy, as the graphic shows.

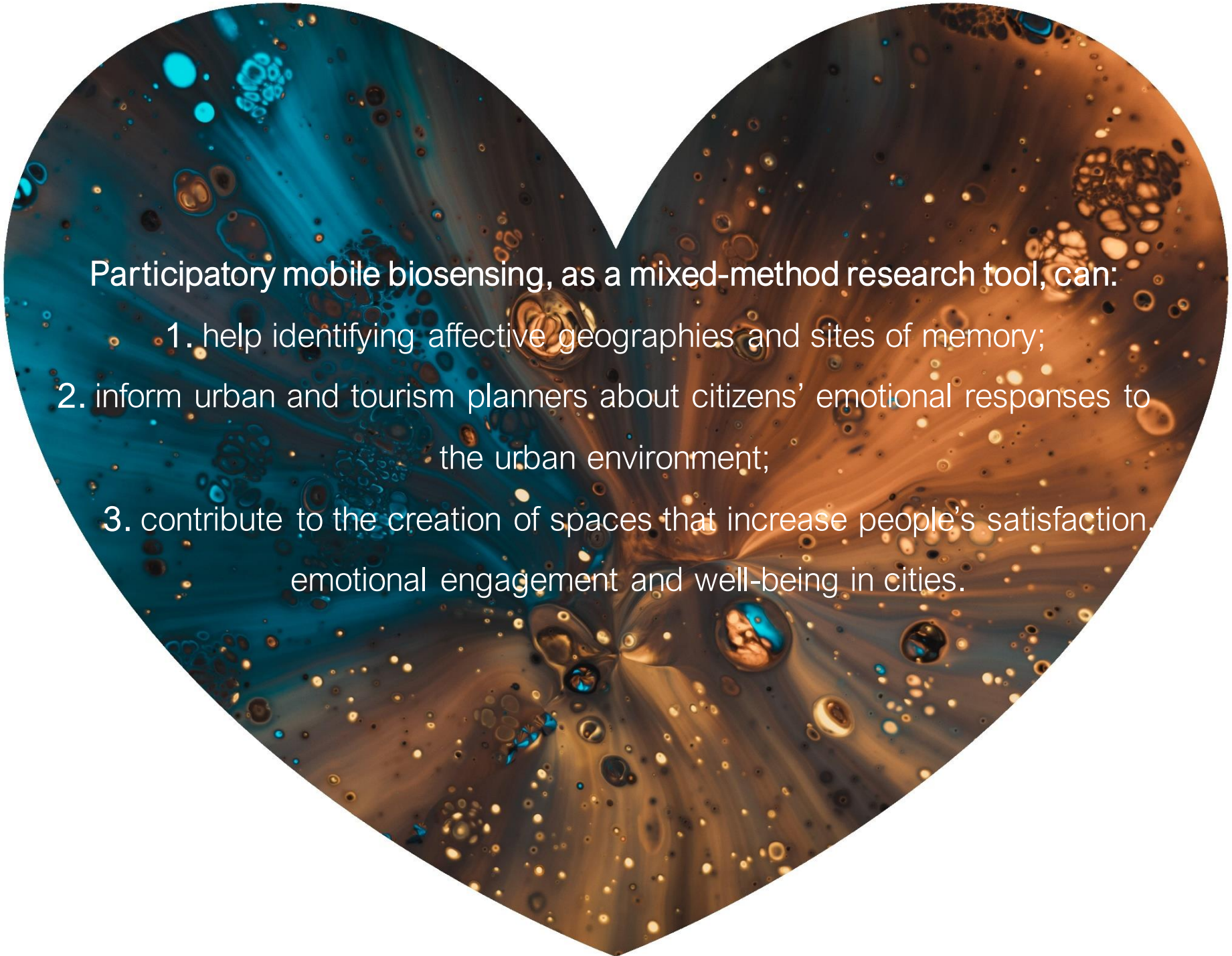
The graphic shows the moment I stopped and enjoyed the breeze.

Preliminary Conclusions

Events of bounded interference show that the ambiguities of biosensing data can be taken as generative drivers for deeper and more detailed discussions about individuals' appropriation of urban spaces.

The elicitation of biosensing data in post-walk interviews is fundamental for the contextualization and the analysis of such data (Stadler et al. 2018; Pykett et al. 2020a; Reif & Schmücker, 2021; Osborne, 2022).

Biosensing can be rethought as an elicitation technique that can be integrated into established qualitative and participatory methods in urban studies.



Participatory mobile biosensing, as a mixed-method research tool, can:

1. help identifying affective geographies and sites of memory;
2. inform urban and tourism planners about citizens' emotional responses to the urban environment;
3. contribute to the creation of spaces that increase people's satisfaction, emotional engagement and well-being in cities.

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Thank you

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