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URBAN STRESS AND PHYSIOLOGICAL AROUSAL IN EARLY PSYCHOSIS

A BIOSOCIAL APPROACH

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by

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Abstract

Although urban living is by now a well-established risk factor for psychosis in cities of the Global North, the mechanisms involved in the relation between cities and psychosis are still unclear (Fett et al., 2019). Urban stress has been hypothesised as a plausible pathway relating psychosis to cities. Hence, identifying which urban situations are the most stress-inducing – and why – is of crucial importance (Abbott, 2012). This is precisely the issue that I address in this doctoral research. Thus, the aim of this study is to refine our understanding of urban stress for persons living with early psychosis and persons with an at-risk mental state for psychosis. On a more general level, this doctoral research aims to expand the field of mental health geography by developing a biosocial approach to urban mental health questions.

For that purpose, I elaborated an innovative and experimental research protocol – between the controlled laboratory and unpredictable real-life situations, straddling human geography and psychiatry – allowing for an *in situ* approach to the study of urban stress for persons living with having experienced a first episode of psychosis, and persons identified as being at risk for psychosis. The research uses mixed-methods combining (i) ambulatory bio-sensing, (ii) qualitative walk-along interviews and (iii) environmental data, collected through GPS and video recordings. Adding bodily reactions to the cognitive and conscious expressions of stress allows me to draw a more complex picture of the ways in which urban situations affect individuals living with early psychosis and persons with an at-risk mental state for psychosis, and take the research towards biosocial mechanisms. The research is based on fieldwork in Basel, Switzerland, with participants recruited within the Basel Early Treatment Service (BEATS), a specialised mental health unit at the University Psychiatric Clinics Basel, committed to the early detection and treatment of psychotic and other serious mental illnesses in young people

Empirically, this study contributes to refine our understanding of 'urban stress' for people living with early psychosis and persons with an at-risk mental state for psychosis, in that the study offers a situated account of certain urban characteristics that are experienced as stressful. Among these characteristics, visual perception of elements in motion have been identified as a potential source of stress. Concurrently, the study revealed that certain portions of the urban environment are systematically experienced as calm, as reflected in both narrative and physiological data. These specific areas allow participants to shift their attention to themselves, to immerse themselves in their own thoughts. Contrast between these calm and more animated areas have been identified as nodal points: the different ambiances and atmospheres and their sensory stimulations, demand varying levels of attention and concentration towards the outside world. This is why I frame the way participants navigate in urban environment as determined by fluctuating 'regimes of attention', which are contingent on the environment. Finally, the impact of the built environment, so often ignored in studies on the city-psychosis nexus, was identified as relating to aspects of openness, which are associated with positive feelings of control in a given situation.

Keywords : Urban Mental health – Geography – Psychosis – Urban Stress – Arousal – Mixed-methods – Interdisciplinarity – Biosocial processes – Skin conductance – At-risk mental state (ARMS) – First Episode Psychosis (FEP) – Ambiance Urbaine – Affective Atmospheres

Résumé

Bien que l'environnement urbain soit aujourd'hui considéré comme facteur de risque bien établi pour le développement d'une psychose, les mécanismes impliqués dans cette relation et permettant d'expliquer ce phénomène restent encore inconnus (Fett et al., 2019). Le stress de la vie urbaine a été proposé comme hypothèse pouvant expliquer cette association. Néanmoins, la notion de 'stress urbain' demeure vague et peu étudiée. Par conséquent, identifier quelles situations urbaines sont les plus stressantes - et pourquoi - est d'une importance cruciale (Abbott, 2012). C'est précisément la question que j'aborde dans cette recherche doctorale. Ainsi, l'objectif de cette étude est d'affiner notre compréhension du stress urbain en travaillant avec des personnes vivant avec une psychose précoce ou présentant un état mental à risque de psychose. De manière plus générale, cette recherche doctorale vise à élargir le champ de la géographie de la santé mentale en développant une approche biosociale des questions de santé mentale urbaine.

À cette fin, j'ai élaboré un protocole de recherche innovant et expérimental qui propose une approche *in situ* de l'étude du stress urbain, situé à mi-chemin entre l'environnement contrôlé d'un laboratoire et les situations imprévisibles de la vie quotidienne. Ma recherche déploie des méthodes mixtes combinant des données physiologiques à des méthodes visuelles et des entretiens qualitatifs mobiles. En me concentrant sur leurs interactions avec l'environnement urbain, l'objectif principal de la recherche est de mieux comprendre où et pourquoi les personnes vivant avec une psychose précoce ressentent du stress en milieu urbain, tant sur le plan physiologique que sur le plan narratif. La recherche est basée sur un travail de terrain dans la ville de Bâle, en Suisse, avec des participant-e-s recruté-e-s au sein du Service de traitement précoce de Bâle (Basel Early Treatment Service).

La combinaison de réactions corporelles et narratives au stress permet de dresser un tableau plus complexe de la manière dont les situations urbaines affectent les participant-e-s. La perception visuelle d'éléments en mouvement a été identifiée comme une source potentielle de stress. Parallèlement, l'étude a révélé que certaines portions de l'environnement urbain sont systématiquement vécues comme calmes, comme le reflètent les données narratives et physiologiques. Ces zones spécifiques permettent aux participants de reporter leur attention sur eux-mêmes, de se plonger dans leurs propres pensées. Les contrastes entre ces zones calmes et celles plus animées ont été identifiés comme des points nodaux : les différentes ambiances et atmosphères ainsi que leurs stimulations sensorielles exigent des niveaux variables d'attention et de concentration vers le monde extérieur. C'est pourquoi je considère que la façon dont les participant-e-s naviguent dans l'espace urbain est déterminée par des "régimes d'attention" fluctuants. Enfin, l'impact de l'environnement bâti, souvent ignoré dans les études sur le lien ville-psychose, a été identifié comme étant lié aux aspects d'ouverture, qui sont associés à des sentiments positifs de contrôle dans une situation donnée.

Mots-clés : Santé mentale urbaine - Géographie - Psychose - Stress urbain - Activation physiologique - Méthodes mixtes - Interdisciplinarité - Processus biosociaux - Conductance de la peau - At-risk mental state (ARMS) – First Episode Psychosis (FEP) – Ambiance urbaine – Atmosphères Affectives.

Table of Contents

1. Introduction 1

2. Research Framework 7

2.1. Introduction 9

2.2. Terminology 10

2.3. Situating the research problem: mental health, place and cities 11

2.3.1. Early Ecological approaches to urban mental health 11
2.3.2. Urban mental health and psychosis in Sociology 14
2.3.3. Urban mental health and psychosis Anthropology 15
2.3.4. Urban mental health and psychosis in Geography 19
2.3.5. Urban mental health in Psychiatry: a story of separation and reconnection 22
2.3.6. Urban mental health and psychosis in Psychiatry 27
2.3.7. Conclusion 38

2.4. Theoretical background: from urban exposure to urban experience 38

2.4.1. From medical to health geography 39
2.4.2. From health geography to posthuman health geographies 40
2.4.3. Conclusion 44

2.5. Article I: An atmospheric approach to the city/psychosis nexus 45

2.5.1. Foreword 45
2.5.2. Summary 45
2.5.3. Introduction 45
2.5.4. Ambiance and affective atmospheres, a common shared spatial perspective 46
2.5.5. Different registers of experience 49
2.5.6. Ambiance, affective atmosphere and urban mental health 52
2.5.7. Methodological perspectives 55
2.5.8. Conclusion 57

2.6. Research Questions 58

3. Methodological Framework 61

3.1. Introduction 63

3.2. Article II: How environments get to the skin 65

3.2.1. Foreword 65
3.2.2. Abstract 65
3.2.3. Introduction 65
3.2.4. Why do we need a biosocial approach to the city–psychosis nexus? 67
3.2.5. Towards a re-vitalized geography of mental health 70
3.2.6. The ‘bio’ in urban mental health 71
3.2.7. The ‘social’ in urban mental health 73
3.2.8. Biosensory ethnographies 76
3.2.9. Conclusion 77

3.3. Research setting **79**
3.3.1. Basel 79
3.3.2. Sampling rationale and recruitment 81
3.3.3. Participants 84

3.4. Study procedure **85**

3.5. Ethical Aspects **87**

3.6. Methodological Bricolage **89**
3.6.1. Bricolage as a mode of research 89
3.6.2. Bricolage, ethics and psychiatry 90
3.6.3. Working with physiological data 91
3.6.4. Ethnographic bricolage 93

3.7. Conclusion **94**

4. Analysis and Results **97**

4.1. Introduction **99**

4.2. Article III: Urban Stress and Emotional Arousal in Urban Environments **100**
4.2.1. Foreword 100
4.2.2. Abstract 100
4.2.3. Introduction 100
4.2.4. Mobile Health and Biosensing Research 103
4.2.5. Methodology 105
4.2.6. Results 110
4.2.7. Discussion and Conclusion 115

5. General Conclusions **119**

5.1. Introduction **121**

5.2. Main contributions **121**

5.3. Interdisciplinarity en acte: on methodology, opportunities and limitations **127**
5.3.1. Conceptual limitations 128
5.3.2. Affect, emotion, geography and biosensing; any contradiction? 129
5.3.3. Biosensing, subjectivity and the collective 135

5.4. Further research trajectories **138**

6. References **143**

7. Appendices **171**

7.1. Appendix A **173**

7.2. Appendix B **185**

7.3. Appendix C **188**

7.4. Appendix D **190**

1. Introduction

> The psychological foundation, upon which the metropolitan individuality is erected, is the intensification of emotional life due to the swift and continuous shift of external and internal stimuli. […] To the extent that the metropolis creates these psychological conditions – with every crossing of the street, with the tempo and multiplicity of economic, occupational and social life – it creates in the sensory foundations of mental life, and in the degree of awareness necessitated by our organization as creatures dependent on differences, a deep contrast with the slower, more habitual, more smoothly flowing rhythm of the sensory-mental phase of small town and rural existence. (Simmel, 1903/2002, p. 11-12).

Today, more than one in two people live in a city. Since 2007, and for the first time in history, there are more people in the world that are living in urban areas than people living in rural areas. With the progressive urbanisation of the world, it is estimated that 68% of the world population will live in cities by 2050. When adding the overall growth of the population, an estimated 2.5 billion people will join urban areas by this time (United Nations, 2018). These growing cities face multiple challenges, including employment, housing, energy and food supply, transportation systems and other infrastructures, as well as the provision of basic services such as education and health care (United Nations, 2018). As urbanisation continues, so do its broader ramifications. The impact of cities on mental health is one of these concerns, and it is the topic of this doctoral dissertation.

Cities and urban environments are polarized milieus when it comes to mental health: they are both associated with positive and negative outcomes. Urban living is associated with a reduced risk for suicide, and the size of the city seems to play a role in this correlation (Melo et al., 2014). Risk for dementia is reduced as well, when compared to rural living (Russ et al., 2012), and so is the risk for cognitive impairment when compared to rural upbringing (Nunes, 2010). It is generally held that urban areas offer better access to mental health services, which should help improve the wellbeing of urban populations, but this is not systematically the case. A meta-analysis highlighted that anxiety disorders increase by more than 20% in urban populations compared to rural inhabitants, and that urban living increases the risk for developing mood disorder by almost 40% (Peen et al. 2010). With regard to psychosis, the differential is even higher. A meta-analysis of this association found that, the risk of developing schizophrenia and other nonaffective psychoses, is more than twice as high when compared to rural living (Vassos et al., 2012). In addition, a dose-response relationship between urban upbringing and schizophrenia has been found (Pedersen & Mortensen, 2001a). In other words, the link between urban living and psychiatric disorders is rather specific to psychosis, in so far that although urban living also affects other psychiatric diagnoses – such as mood and anxiety disorders – it does so at a much lower rate (Peen et al. 2010). However, a recent study shows that this relation does not seem to exist in low- and middle-income countries (DeVylder 2018), indicating that it depends on specific – rather than universal – urban forms, societies or cultures. Thus, urban living is known today to be a risk factor for psychosis in the global north, and evidence supports that "urban living and upbringing per se, rather than other epidemiological variables, […] increase the risk for mental disorders" (Adli, 2011, p. 2). The establishment of this (causal) relationship is momentous, in that the precise characterisation and distinction of the urban environments involved in this association become a task for (psychiatric) research (Bieler, 2021a).

Although urban living is by now a well-established risk factor for psychosis in cities of the Global North, the mechanisms involved in the relation between cities and psychosis are still unclear (Fett et al., 2019). Urban stress has been hypothesised as a plausible pathway relating psychosis to cities. But urban stress is a broad and rather fuzzy category. Hence, identifying which urban situations are the most stress-inducing – and why – is of crucial importance (Abbott, 2012, p. 164), even more so in a rapidly urbanising world, where it is estimated that 23 million persons live with psychosis. This is precisely the issue that I address in this doctoral research. Adopting a biosocial approach, my research aims to better understand where and why people with living with early psychosis and persons with at-risk mental state for psychosis experience discomfort, physiological arousal and/or stress in cities. For that purpose, I elaborated an innovative and experimental research protocol – between the controlled laboratory and unpredictable real-life situations, straddling human geography and psychiatry – allowing for an *in situ* approach to the study of urban stress for persons living with having experienced a first episode of psychosis, and persons identified as being at risk for psychosis. The research uses mixed-methods combining (i) ambulatory bio-sensing, (ii) qualitative walk-along interviews and (iii) environmental data, collected through GPS and video recordings. Adding bodily reactions to the cognitive and conscious expressions of stress allows me to draw a more complex picture of the ways in which urban situations affect individuals living with early psychosis and persons with an at-risk mental state for psychosis, and take the research towards biosocial mechanisms.

Empirically, this study contributes to refine our understanding of 'urban stress' for people living with early psychosis and persons with an at-risk mental state for psychosis, in that the study offers a situated account of certain urban characteristics that are experienced as stressful. Among these characteristics, visual perception of elements in motion have been identified as a potential source of stress. This is something that is underexplored in other experienced-based studies, where noise seemed to be more prominent as a source of stress. Concurrently, the study revealed that certain portions of the urban environment are systematically experienced as calm, as reflected in both narrative and physiological data. These specific areas allow participants to shift their attention to themselves, to immerse themselves in their own thoughts. Contrast between these calm and more animated areas have been identified as nodal points: the different ambiances and atmospheres and their sensory stimulations, demand varying levels of attention and concentration towards the outside world. This is why I frame the way participants navigate in urban environment as determined by fluctuating 'regimes of attention', which are contingent on the environment. Finally, the impact of the built environment, so often ignored in studies on the city-psychosis nexus, was identified as relating to aspects of openness, which are associated with positive feelings of control in a given situation.

This doctoral thesis takes the form of a cumulative dissertation. It comprises three articles, out of which two have been published in international peer-reviewed journals. The third is currently under review. The three articles are incorporated in a larger frame in which I situate the publications within disciplinary approaches, describe the research project, show how the articles connect with each other and with higher concerns, as well as elaborate on their relevance and implications for future research. The dissertation is structured in three core parts

(discounting this introduction and the general conclusions), each of which is articulated around one of the three articles.

The first part is the research framework. This part examines the main research issues at stake in the city-psychosis relationship. I discuss the positioning of my research within wider disciplinary fields, identify gaps in the research, propose the conceptual framework that guides this research and conclude by identifying the main research questions. This first part includes my first peer-reviewed article, which critically discusses the notions of *urban ambience* and 'affective atmospheres'. The theoretical approach developed in this article allows me to unearth lines of investigation that foreground an experiential perspective and an *in situ* approach:

Winz, M. (2018). An atmospheric approach to the city-psychosis nexus. Perspectives for researching embodied urban experiences of people diagnosed with schizophrenia, *Ambiances. Environnement sensible, architecture et espace urbain*. [Online], Varia. https://doi.org/10.4000/ambiances.1163

The second part is the methodological framework. It elaborates a methodological proposition distilled from the conceptual discussion held in the first article. In this part, I consider the need for a biosocial approach to the city/psychosis nexus, as well as suggest one possible way to tackle these questions. Furthermore, I describe the study procedure and discuss the rationale behind it, as well as examine ethical aspects that are raised by my study. To conclude, I critically look at my own research process in a more reflexive discussion. This second part is structured around the second peer-reviewed article. In this article, I develop my methodological approach, that pushes the notion of experience onto unexplored terrain with regard to the city/psychosis nexus, since it conveys autonomic bodily stress reactions indexed by skin conductance:

Winz, M., & Söderström, O. (2021). How environments get to the skin: biosensory ethnography as a method for investigating the relation between psychosis and the city. *BioSocieties*, *16*(2), 157-176. https://doi.org/10.1057/s41292-020-00183-8

The third part of the thesis presents the results and discussions based on the empirical component of my study. This is where I examine in more detail the dimensions of sensory perception, spatial sequences and built environment identified by the sub-questions and their roles in physiological arousal and feelings of stress expressed by the participants. This discussion is held in the third article:

Winz, M., Söderström, O., Rizzotti-Kaddouri, A., Visinand, S., Ourednik, A., Küster, J., & Bailey, B. (2022). Stress and emotional arousal in urban environments: A biosocial study with persons having experienced a first-episode of psychosis and persons at risk. Health & Place, 75, 102762. https://doi.org/10.1016/j.healthplace.2022.102762

To conclude I synthesise the results and contributions of my research, while situating them in relation to the existing work on the relationship between urban environment and mental health. My research is a tentative response to the mainly decontextualised analyses of the city in the life sciences and psychiatry (although there are exceptions), as well as to the disembodied geographical and ethnographic accounts of urban experiences in research on mental health that do not engage with the biology and permeability of human bodies. Finally, I critically discuss the methodology I developed and deployed in my research, before proposing new research avenues that my study opens up.

2. Research Framework

2.1. Introduction

The city/psychosis nexus is situated within the larger concerns of the impact of cities on mental health, and more broadly of the link between health and place. Concerned with the entanglement of urban environment and psychosis, my research is positioned at the intersection between the way geography, sociology and psychiatry approach the relations between environment, people and mental health, since these three disciplines produced and still produce critical work on the subject. The aim of the research framework is to situate my work within these research strands. Building on a critical discussion of how sociology, geography and psychiatry have approached this topic, this first part of the thesis will highlight crucial research gaps, present the specific conceptual background that underpins my approach and identify the research questions that guide my work. The first part of the dissertation is structured as follows:

First, I clarify some terminology (chap. 2.2). Then I situate my research within the broader research trends on the topic (chap. 2.3). I examine the relation between mental health, place and cities through a brief historical overview. This chapter tracks the emergence of academic interest in the link between psychosis and cities in the first part of the 20th century, which is deeply rooted in the social sciences. Despite these early acknowledgements of the entanglement between urban environment and psychosis – coming mainly from sociology and geography – the topic has been ignored by mainstream psychiatry during the 20th century (with a few exceptions) and only truly emerged within the discipline in the 1990s. I explore the reasons for the late emergence of the topic in psychiatry during the second half of the 20th century, before critically examining the more recent work stemming from psychiatry. This is important because it is this literature that crystallised urban living as a risk factor for psychosis. Finally, I identify the limits of epidemiological approaches which underpin research in psychiatry, in order to open relevant research gaps.

Following this, I consider the contributions of a geographical approach and the conceptualisation of the link between mental health and place (chap. 2.4). To understand the contributions of health geography and to situate the conceptual approach that underpins my research, a brief overview of the history of modern health geography is warranted. Here, I focus on two key moments: (i) the humanistic or qualitative and 'place sensitive' turn, that took place in the 1990s, and (ii) the posthuman turn that followed during the early 21st century.

In the fifth chapter (chap. 2.5), I present the conceptual approach of my study, by means of the first peer-reviewed article constitutive of this thesis. Drawing upon the discussion held so far, the research framework concludes with the identification of major research gaps, as well as with the presentation of the main research question guiding the study and the according sub-questions in a final section (chap. 2.6).

2.2. Terminology

Mental disorders (also called mental illnesses, psychiatric disorder or mental health disorders) refer to diagnosable health conditions, that involve changes in emotion, thinking or behaviour and that is associated with distress and ability to function in daily life (Parekh, 2018). There are many mental disorders, among which we find depression, bipolar disorder, dementia, autism and schizophrenia and other psychoses.

Psychosis refers to a condition where emotion and thought are affected in such way that it causes one to lose touch with reality. A psychotic episode is often, but not necessarily, accompanied by a series of hallucinations (seeing or hearing things that others do not) and/or delusional thoughts (false beliefs). Rather than a disorder, psychosis refers to a symptom, that can be triggered by various causes. Thus, different diagnoses fall under the scope of psychosis, usually categorised in affective or non-affective psychoses. The former refers to forms of psychosis characterised by a severe disturbance of mood, such as bipolar disorder with psychotic features and major depression with psychotic features (Ramain et al., 2020). The latter refers to schizophrenia spectrum disorders (Ramain et al., 2020). Today, this dichotomy, is challenged by the idea that there might be a continuum between affective and non-affective forms of psychosis (Ramain et al., 2020). In this manuscript, I use the term 'psychosis' rather than 'schizophrenia' because it is less stigmatising[1], except when describing work that explicitly reports studies on 'schizophrenia' To refer to more general trends that are not specific to a condition, I use the terms 'mental health', 'mental disorder' and 'mental illness'.

Early psychosis, also known as first episode psychosis (FEP), refers the phase when a person shows signs of losing contact with reality for the first time, in experiencing apparent psychotic symptoms. Psychotic episodes seldom appear out of the blue, but are generally preceded by a phase where symptoms are more subtle, often difficult to recognise a such. Early intervention for people suffering from a first episode of psychosis (FEP) strives to prevent long-term outcomes and relapse (Ajnakina et al., 2019), since psychosis can be limited to one episode and is not necessarily chronic. I use the terminology 'persons having experienced a first episode of psychosis' and FEP to refer to these participants.

In order to develop preventive treatment even before a first episode of psychosis, various tools have been developed to identify individuals with an at-risk mental state for psychosis (ARMS), who are thought to be at high risk for developing psychosis[2]. The ARMS phase "is characterised by either 'attenuated' psychotic symptoms, or full-blown psychotic symptoms that are brief and self-limiting" (Ajnakina et al., 2019, p. 529). At-risk mental state (ARMS) is thus "a term which is used by health professionals to describe adolescents and adults who are experiencing perceptual changes that may be early, low level, signs of psychosis" (Paust et al., 2019, p. 2). This phase before a full-blown episode is also called 'prodrome' or 'prodromal phase'. However, the ARMS term – or its equivalents such as 'clinical high risk' or 'ultra-high risk'–

[1] An exception to this usage of the terminology is to be found in the first peer-review article, since this paper was written and published at an early stage of the PhD process.

[2] This category is subject to debate, regarding the utility and risks associated with it. For a recent critical discussion see Ajnakina et al. (2019).

is used increasingly, because, unlike the term 'prodromal' that suggests the inexorable appearance of psychosis, it highlights the variability of the possible outcome (Paust et al., 2019). I use the terminology 'persons with an at-risk mental state for psychosis' to refer to these participants. The expression 'early psychosis' is used sometimes, when referring to both groups of participants together.

2.3. Situating the research problem: mental health, place and cities

The aim of this chapter is to contextualise my research by providing insights into the way (mental) health, place and the city – and the relations between them – have been understood since the early 1900s. This allows me, in a following step, to situate my study within a larger trend initiated in the early years of the 21st century, when urban living – or *urbanicity* as it is often labelled within psychiatry – became a shared concern for some psychiatrists, sociologists and geographers, with regard to mental ill/health issues.

To do so, I first provide a brief review of the history of the relationship between (mental) health and urban environments (section 2.3.1), and discuss milestones and seminal works of this trajectory in sociology (section 2.3.2), anthropology (2.3.3) and geography (section 2.3.4). Following that, I address the reasons of the dormancy and the subsequent re-emergence of this topic within psychiatry in the second part of the 20th century (section 2.3.5) and then I highlight the main lines of the research on the association between urban environments and psychosis within psychiatry since the beginning of the 21st century (section 2.3.6). Discussing the way psychiatry addresses urban environments allows me to identify, in a final step, the need for a geographical approach to the city/psychosis nexus. While recent work in psychiatry, following an epidemiological approach, established the urban environment as a risk factor for psychosis, the mechanisms linking the two remain unknown. Here I argue that a geographical approach, more attuned to the relational, dynamic and experiential dimensions of city living can help better understand these mechanisms. This discussion will be held in the following chapter of the research framework (chap. 2.4).

2.3.1. Early Ecological approaches to urban mental health

The claim that the 'environment', 'context', 'milieu' or 'place' matters when it comes to health questions is not new. In health and medical geography literature, Hippocrate's *On Airs, Waters, Places* – written in the fifth century BC – is often considered to be one of the first attempts to link health and disease to physical and social environmental factors (Cummins et al., 2007; Curtis et al., 2010; Macintyre & Ellaway, 2003). His model of health was grounded in an ecological interpretation of health – and even of urban health, since he wrote on ancient Greek city-states among other environments. Thus, the entanglement between health and (urban) environment has very deep roots. However, the present resurgence of interest in physical and social environmental determinants of mental health in social sciences (mostly in sociology, geography, psychology and public health), psychiatry and epidemiology, is anchored in the major societal transformation that western countries experienced during the industrial revolution.

During the eighteenth century, due to growing urbanisation, the relation between health and environment became of interest to scholars in Europe, with cities in England, France, Germany and Sweden keeping records on population and causes of death (Macintyre & Ellaway, 2003). As Macintyre and Ellaway note, "[a] common observation during this period was the greater healthiness of country dwelling" (Macintyre & Ellaway, 2003, p. 20). Industrialisation during the eighteenth and nineteenth centuries, which triggered massive rural exodus, produced cities with high levels of pollution, overcrowding and sanitary problems that led to the spreading of infectious diseases. Throughout the nineteenth century, attempts to map infectious diseases such as cholera in Europe and yellow fever in the United States – using 'dot maps' – accompanied the study of these epidemic events (Rican & Salem, 2010).

One of the most famous is the dot map of cholera incidence in Soho (London) by John Snow in 1854 (McLeod, 2000). By showing spatial clustering of cholera cases around a particular water pump, this map supported his hypothesis of contaminated water being responsible for the spreading of the disease, and helped put an end to the epidemic[3]. Often cited in medical and health geography as a pioneer, John Snow is regarded as the founding figure of modern epidemiology, since "measuring incidence and prevalence in search of correlations with circumstances that might clarify the etiologies of diseases" (Sabel et al., 2010, p. 118) is the basis for modern epidemiology. Snow's work is considered "as a landmark in progress in the 'Sanitary Model' of public health, which in nineteenth- and early twentieth-century Europe and North America concentrated on improvements in basic hygiene that were necessary to prevent outbreaks of infectious disease occurring in major cities of the time" (Curtis et al., 2010, p. 327). His approach showed how geography (the term medical geography was not coined yet) and spatial analysis informed public health interventions, in a time when public health as a discipline or formalised conception of collective intervention was still embryonic. More broadly, by showing the spatial clustering of cases around a specific water pump, Snow's approach supported a germ model theory of disease, in a time when medicine was still dominated by the miasma theory[4], and had barely started to transition towards the germ model (Rican & Salem, 2010, p. 97).

From infectious diseases, spatial analysis quickly extended to chronic and degenerative diseases (Rican & Salem, 2010, p. 97), and to mental illness. Spatial epidemiology of mental health problems – or 'insanity' as it was often called at that time – can be traced back to the work the Danish physician JR Hübertz. In 1839, Hübertz showed that mental illness was unequally distributed between the Danish countryside and Copenhagen, with more people reported as mentally ill in the city (Shorter, 2017). From 1860 onwards, various studies, based on surveys of the late nineteenth and early twentieth century in different regions, found evidence confirming the finding that mental illness is more common in cities than in rural areas (Shorter, 2017). In 1939, Robert E. Faris and H. Warren Dunham, two sociologists close to the Chicago

[3] McLeod (2000) actually also shows that the exact events and intervention by Snow have partly been mystified throughout the following decades – in particular the fact the removal of the handle of the identified pump was an idea of Snow himself remains confuse.

[4] According to the miasma theory, diseases are caused by poisonous emanations. In the second half of the 19th century, this theory was progressively replaced by the germ theory, according to which "diseases are spread and caused by the presence and actions of specific micro-organisms within the body through many mediums such as water, food, and contact" (Kanadan, 2018, p. 42)

School of sociology, published a monography called *Mental Disorders in Urban Areas. An Ecological Study of schizophrenia and Other Psychoses* which is a seminal work in the development of the 'ecology' hypothesis" (Bloom, 2002, p. 70) in urban mental health. The importance of this study lies in the way the authors conceptualise the association of mental disorders and urban environments. While early studies of the 19th century interested in the link between mental health and cities took place in a context dominated by somatogenic theories of mental health (Bloom, 2002, p. 68), where mental disorders were thought to originate in the body and disruptions to its physical functioning, Faris and Dunham's approach is underpinned by a psychogenic model of mental disorders. In this pioneering work, Faris and Dunham explored the relation between the spatial distribution of psychosis and social organisation in the city of Chicago. This study produced two major findings. First, Faris and Dunham showed a difference in the spatial distribution of the rates of first admissions for schizophrenia and for affective psychosis (psychotic depression, bipolar disorders), and second, the spatial distribution of first admissions for schizophrenia followed a centre-periphery pattern: "[w]hile rates of schizophrenia decreased as the distance from the center increased, rates of affective psychosis […] were more evenly distributed across central and peripheral areas" (Heinz et al., 2013, p. 187).

In other words, this study was the first showing that rates of schizophrenia were two times higher in the inner city than in the outskirts. The idea underpinning their approach is that social disorganisation, a concept developed in the Chicago School of sociology, is a plausible (sociological) explanation for mental disorders. Hence, Faris and Dunham rejected the so-called 'urban drift hypothesis', in favour of the 'breeder hypothesis' to explain the link between mental disorders and urban environments. The 'drift hypothesis' explains the higher concentration of mental disorders in inner cities through mechanisms of selective migration – i.e. people with mental disorders or people at risk for mental disorders moving towards these specific areas (Verheij, 1996). In contrast, the 'breeder hypothesis' states that the living conditions in these areas – i.e. the environmental stressors such as housing quality, lack of social cohesion, etc. – are responsible for the higher concentration of mental disorders (Verheij, 1996) [5]. Their research found that social disorganisation, mainly operationalised through isolation and poor communication, is a causal factor in cases of psychosis as it provides fewer resources for social integration. In contrast, most of the early inquiries mentioned above were situated quite far from such sociological hypotheses. This first systematic analysis by Faris and Dunham (1939) of the relation between psychosis and social economic and housing conditions is considered a foundational study for the disciplines of medical sociology and geography of mental health (Söderström, *In press*). In the following, I concisely review important contributions of both disciplines to urban mental health questions, as well as I discuss significant work stemming from anthropology.

[5] The question of whether higher rates of psychosis in inner cities is due to people diagnosed with schizophrenia drifting there or due to the social conditions prevailing in those place – the *breeder* Vs the *drift* hypothesis – is still discussed today (see Hudson 2012). The dichotomy of this distinction – "one of places that produce effects; the other of places as destinations" (Philo, 2005, p. 587) is also subject to criticism (see Philo, 2005).

2.3.2. Urban mental health and psychosis in Sociology

Sociologists from the Chicago School attempted to generalise Faris and Dunham's findings by conducting similar studies in other cities. In 1942, Clarence W. Schroeder published the results of a multisite study, conducted in five Midwestern cities: Kansas City, Milwaukee, Omaha, St Louis and Petoria. Although there was less data available, and with some slight variations, this study also found higher rates of schizophrenia in inner cities. That said, the available data was inconclusive on the hypothesis that isolation may be responsible for this clustering. Higher rates of schizophrenia cases in central city areas of lower socioeconomic status have since been confirmed by further studies in Worcester, Massachusetts (Gerard & Houston 1953); Rochester, N.Y. (Gardner & Babigian 1966); and Baltimore, Maryland (Klee et al. 1967), as well as in Europe in the cities of Oslo, Norway (Sundby & Nyhus, 1963) and Bristol, England (Hare, 1956), as reported by Kohn in a review published in 1973 (Kohn, 1973). Sociologists were also interested in the association of schizophrenia and occupational status and income. Higher rates of schizophrenia in lower status occupations relative to higher status occupations have been observed repeatedly (Clark 1948; Kohn, 1973). The majority of these early studies converged towards the same conclusions, but there were also exceptions. In 1959, investigating the relation of schizophrenia to the social structure in small cities in Hagerstown, Maryland, Clausen and Kohn (1959), did not find any correlation between occupation or social status of urban areas and schizophrenia.

The interest in urban mental health questions within sociology continued throughout the second half of the 20th century, with a focus on the dynamic relationships between the heterogenous populations that make a city, focusing on relations between groups (Kelly and Green, 2019). Hence, research in this strand was interested in the way various socio-economic factors, such as poverty, inequality precarity, gender discrimination, racism, social exclusion, threat and violence relate to mental distress. The underlying assumption was that social conditions and/or the relations between groups can cause stress for member of disadvantaged groups, which, in turn, can cause mental illness (Meyer et al. 2008). On the question of how urban environments influence the risk for psychosis, "[m]igrant/minority status has been viewed as particularly important, because migrants often leave poor living conditions with limited opportunities to seek improvement in urban areas" (Fett et al., 2019, p. 239). Nevertheless, findings are not univocal; ethnic density seems to reduce the risk for psychosis through social support and less discrimination (Schofield et al. 2017, see also Fett et al., 2019). There are also geographical variations of the association between psychosis and socio-economic factors; economic deprivation, social isolation and psychosis have been found to be associated with a greater risk for psychosis in the UK, but not across Europe (Fett et al. 2019). These sociological approaches made important contributions to the social stress theory of health inequalities and emphasised the importance of the social determinants of mental health, during a period dominated by biological explanations of mental illness in psychiatry[6]. However, they are concerned with stress on a structural rather than an experiential level.

[6] I discuss this aspect more specifically in section 2.3.5

In this respect, recent developments within sociology are of particular interest for my own approach to the city/psychosis nexus. Some sociologists proposed to redraw the definition of the 'urban', and called for expanding and refining our lines of inquiry:

> "Can we extend such analysis beyond these 'traditional social factors', to encompass issues such as the built environment, the capacities and limits to individual and collective life engendered by the urban infrastructure, and the urban 'sensorium' of noise, smell, touch and microbes?" (Rose, 2020, p. 35)

In the pursuit of such ambitions, Fitzgerald et al. (2016) have invited social scientists to develop new research strategies, and they argued for the necessity to rethink the links between the social sciences and biology when investigating the city/psychosis nexus. While suggesting four areas of engagement between sociology and biology in urban mental health research – *attending to life-as-such; bioeconomies of urban experience; intra-actions of bodies and cities; biological localities* – it is not intuitively and immediately clear how social scientists can achieve such biosocial engagement both practically and methodologically. The second peer-reviewed article of the thesis[7] (presented in chap. 3.2) further examines the need for a biosocial approach to the city/psychosis nexus and describes the methodology I developed as a response to this call. Having briefly reviewed the way sociology addressed questions of urban mental health, the next section examines contributions from anthropology to the study of urban mental health issues.

2.3.3. Urban mental health and psychosis Anthropology

Constructivist and interpretative approaches developed in medical anthropology, especially after WWII, pushed forward critical thinking on (urban) mental health in anthropology and beyond, by considering disease as a cultural construct and therefore questioning the dominant biological and biomedical models of mental health. Work of anthropologist and psychiatrist Arthur Kleinman's is seminal in developing such approach, and nourished many early inquiries into the relation between mental health and cities in anthropology. Kleinman defined medical or health care systems as 'cultural systems':

> In every culture, illness, the responses to it, individuals experiencing it and treating it, and the social institutions relating to it are all systematically interconnected. The totality of these interrelationships is the health care system" (Kleinman, 1980, p. 24)

It appears here that "disease has its ontological grounding in the order of meaning and human understanding" (Grønseth, 2009, p. 11). Central in the approach proposed by Kleinman is the concept of 'explanatory models', which proposes to grasp the entanglement of the various interactions that arise around sickness as the expression of such cultural understanding of a condition:

> Explanatory models [EMs] are the notions about an episode of sickness and its treatment that are employed by all those engaged in the clinical process. The interaction between the EMs of patients and practitioners is a central component of health care. (Kleinman, 1980, p. 105)

[7] Winz, M., & Söderström, O. (2021). How environments get to the skin: biosensory ethnography as a method for investigating the relation between psychosis and the city. BioSocieties, 16(2), 157-176.

Thus, disease is not understood as "*an entity but an explanatory model"* (Good, 1996, p.53, italics in original). In doing so, Kleinman introduces the idea of 'category fallacy', to point the fact that disease is falsely considered as a natural phenomenon. As such, "it is the mistaken belief that our categories belong to nature and that disease as we know is natural and therefore above or beyond (or deeper than) culture..." (Keinman, 1977, quoted in Good 1996, p. 53). Such conception of ill health foregrounds the subjective dimensions of disease, hence the fact that the interpretative approach in medical anthropology is often attributed to Kleinman. To further develop such approach, Kleinman introduces a fundamental distinction between illness, and disease. By *illness* Kleinman refers to the "innately human experience of symptoms and suffering" (Kleinman, 1988, p 3). *Disease* however refers "to the practitioner's concern with biologic structure and functioning (p 5). In addition, Kleinman defines *sickness* as the "the understanding of a disorder in its generic sense across a population in relation to macrosocial (economic, political, institutional) forces" (p 6). From an anthropological stance, illness and sickness are of prime interest, and illness asks for an interpretative approach to understand the suffering of persons. Thus, medical anthropology calls for a shift in the focus towards the patients, and an attention towards their feelings, emotions and ordinary daily lives:

> Rather than focusing on representations in themselves, the interpretative tradition has investigated how meaning and interpretative practices interact with social, psychological, and physiological processes to produce distinctive forms of illness and illness courses. (Grønseth, 2009, p. 11).

With regard to psychosis such approach pushed research into questioning what biomedical models call 'psychotic experiences'. In the context of postwar deinstitutionalization, anthropologists started to shed light on what happens outside of institutional treatment center, particularly in urban contexts, where they revealed a sense of embodied precarity of the mentally ill (Söderström et al., 2019).

In her classical ethnography, Estroff (1985) builds on this interpretative approach to depict how chronic psychiatric clients struggle as they build a new life outside of mental hospitals in Madison, Wisconsin. Her book, 'Making it crazy', is based on approximately two years of fieldwork, exploring the routines of service users and provides a powerful in-depth ethnography of the lives of schizophrenia patients in the context of deinstitutionalization in America, by describing the wide range of coping strategies developed by the patients in their everyday lives. Experience and ordinary lives of people living with mental troubles is at core also in Robert Desjarlais' account of similar dynamics (Desjarlais, 1994; 1996). In 'Shelter Blues' (1997), Desjarlais portrays and examines the everyday lives of people residing in Boston's Station Street Shelter, often concerned with mental problems. In his ethnography, Desjarlais sticks closely to the views of the people he talks to and by doing so offers insightful report on the intertwining of mental illness and homelessness, and the way both are understood in America. Desjarlais contrasts 'experience', which he understands as an active engagement with the world, to what he labels 'struggling along', understood as more passive and tacit mode of being into the world:

> A good day for someone who experiences might one in which there is a novel integration of personal undertakings, a tale to be t about events bordering on the adventuresome. The features of such a day builds on stuff of novelty, transformation, emplotment, and

> movement. A good day for who struggles along, in contrast, might be a smooth one, where nothing much where a few bucks are earned, where the voices are not too bad, where pre relieved through pacing, and where there are enough cigarette. (Desjarlais, 1994, p. 896-7).

In the same vein, Caroline Knowles further explores the spatialities of the mentally ill outside of mental health institutions, seeking to answer the crucial question of “What happens when the mad are let out of the asylum and there is nowhere for them to go?” (Knowles, 2000, abstract). She provides a rich ethnography of the precarious lives lived by mentally ill homeless persons, who find refuge in shelters, shopping malls and fast-food restaurants, to face a distraught daily life on the streets.

All these accounts not only provide thick descriptions of ordinary daily lives of persons living with mental health troubles, but engage simultaneously with the wider socio-political context of North America, characterized by deinstitutionalization and neo-liberalism, to question the broader system of social welfare, arguing that the ‘community mental health care system’ towards which the US are transitioning “is a system of neglect” (Knowles, 2000).

More recent contributions from anthropology offer important insights into recovery processes located and anchored in urban context, underlining the various strategies developed by patients to navigate urban context, as well as highlighting the potential restorative effect of certain urban spaces. Duff (2014) develops a detailed ethnographic analysis of the recovery trajectories of people with psychiatric disorders in the city of Melbourne, Australia. Duff pays particular attention to the social, material and affective dimensions of public and semi-public spaces that may act as resources in a recovery process. In his approach, social resources are characterized by the means and processes used by patients to maintain and foster social ties. Material resources are defined as the set of possibilities for appropriating places and objects that play a therapeutic role in the trajectories of individuals. Finally, affective resources are characterized by a series of feelings and emotions that impact an individual’s' ability to act and potentially moderate their experience of disorders. Duff highlights that specific spatially and temporally located combinations of these resources are prone to ‘becoming well’, in that they create an ‘event of recovery’. The combination of these resources is captured by Duff with the concepts of ‘atmospheres of recovery’ and ‘assemblages of health’, and the associated spatialities with the notion of “enabling places” (Duff, 2012).

In a similar vein, Martina Klausner's (2015) ethnographic work analyses the recovery trajectories of three participants with psychiatric disorders in the city of Berlin. Klausner highlights an intertwinement between the fluctuations of symptoms and the non-linear process of recovery on the one side, and the daily life of service users, characterized by a constant back and forth between the psychiatric hospital, their home and other urban spaces. As people gradually become more stable and independent, Klausner shows how patients use various tactics and strategies to reclaim urban space and appropriate places that are favorable to their well-being. Klausner uses the term "niching" to describe the gradual process of reclaiming urban space and finding places that are conducive to well-being. These include both non-institutional places, such as public places, cafés and parks, and private and institutional facilities. The notion of ‘niching’ has been further developed by the Berlin-based anthropologists, to describe “the processes by which people living with a psychiatric diagnosis

engage in rendering the urban environment habitable" (Bieler & Klausner, 2019), and includes also the wider socio-political context:

> We refer to these practices as 'niching', emphasising the never-finished ambivalent processes of creating a precarious comfort zone in urban space (Bister et al., 2016). Niching as a concept is not reducible to subjective experience or the practice of an individual, but rather highlights the manifold relations of people living with a psychiatric diagnosis with urban environments, mental health care infrastructures, bureaucratic routines and urban governance. (Bieler and Klausner, 2019, p. 203)

Developing this line of research through a 'co-laborative' long-term ethnographic inquiry with mental health service users, Patrick Bieler studies transformations in the Berlin housing market and their effects on community psychiatric care. He highlights how the structure of the housing market in Berlin – characterized by the lack of affordable housing combined with important gentrification processes in the inner-city – pose major problems for the mental health care system and providers, which percolate into the daily lives of service users:

> Mental health care clients were threatened by (potential) eviction from their homes, while the population of homeless people applying for mental health care services dramatically increased. This not only had an impact on the affected people themselves, but also posed problems for the mental health care services that provide apartments for their clients. On the one hand, the service providers were afraid of rental contract cancellations and their clients losing apartments, while on the other, their housing resources and work capacities were too limited to effectively deal with the situation. (Bieler, 2021, p. 46).

This body of anthropological work on mental health has forged an important critical understanding of mental disorders as biologically determined constructs, fostering approaches that emphasize the lived experiences of the service users. In shifting the focus towards the individuals, this strand of research shed light on the daily lives and modes of dwelling of service users, underlining the strategies and tactics developed in order to navigate through the complexities of urban environments. Narratives of these experiences experience, subjectivity, and embodiment became an essential concern with this research strand.

However, inclusion of the point of view of the mentally ill did not prevent anthropologists from considering wider socio-political forces in their accounts, which are crucial for a broader understanding of the entanglement between urban contexts and mental health. This is certainly one of the strengths of these approaches and an important contribution of this body of work, that allows reading experiences of the mentally ill as a sense of embodied urban precarity (Söderström, 2019).

Moreover, research in anthropology highlights that urban environments are not only deleterious, and emphasize the way how fluctuating processes of recovery draw upon an active interplay between the material, social, affective and sensory urban environment and a process of reclaiming urban spaces as part of the daily lives of the patients. While wellbeing-oriented approaches are important to understand current approaches in geography towards urban mental health question, the flipside is that anthropological investigations into the relation between urban areas and mental health are not directly and explicitly concerned with etiological questions.

2.3.4. Urban mental health and psychosis in Geography

In a thorough review, Chris Philo and Jennifer Wolch identified two waves of research in the history of the geography of mental health, with a third wave underway as they wrote in 2001 (Philo & Wolch, 2001). The first wave was concerned with mental health care provision, and "the focus was on spatial-distributional questions, tracing the shifts of people with mental health problems, historically considered 'deviant', from largescale asylums or hospitals into the community" (Philo & Wolch, 2001, p. 231). This research was interested in: (i) locational analysis of mental health care infrastructures inherited from the asylum era, (ii) the transition from large-scale mental health facilities to community-based care mental health services in the context of deinstitutionalisation, and (iii) issues of homelessness among (ex-)patients that were generated by this process (Philo & Wolch, 2001). The second wave, under the impulse of the 'cultural turn', focused in on the micro-level and became more attentive to individual human perceptions. Hence, this strand of research steers away from an interest in spatial patterns of the distribution of mental disorders, towards more interpretative approaches (Philo & Wolch, 2001). Here the geography of mental health engages with question of difference, identity and everyday life (Philo & Wolch, 2001), as well the dense and complex entanglement of these aspects. The third wave was an invitation to "harness a variety of theories and methods to enable us to understand nuanced 'place-specific' happenings *as well as* more structurally-determined 'space compressing' processes (Philo & Wolch, 2001, p. 238). Almost two decades later, in an updated overview of the geography of mental health, McGeachan and Philo (2017) identify four interconnected strands of research, that overlap with the 'three waves' identified by Philo & Wolch in 2001; (i) 'spatial epidemiology' and (ii) the 'psychiatric city', (iii) provision and the complex spaces of care and (iv) therapeutic landscapes. I review these four strands in order to highlight the way geography, as a discipline, has approached the relation between urban environments and mental health.

I discuss the first (i) and second (ii) research axes together, since they are very much interconnected. Influenced by the investigations of the Chicago School, human (urban) geographers started to take hold of the topic during the 1960s and the 1970s through an ecological approach (Jones, 2001). Early geographical studies of mental health were interested in mapping the spatial distribution of mental illness in different social areas of the cities (Jones, 2001), in order to "reconstruct what can be termed the 'psychiatric geography of the city'" (McGeachan & Philo 2017). Such an approach – also labelled 'spatial epidemiology' or 'spatial ecology' – is exemplified by studies conducted in English cities, such as in Nottingham, in a seminal work by Giggs (1973), Southampton (Taylor 1974, cited in Jones 2001), Plymouth (Dean & James, 1981), Brighton (Bagley et al., 1973), Bristol (Ineichen et al. 1984), Salford (Nutter & Thomas, 1990) – but also in the Republic of Ireland (Pringle et al., 1995), in Mannheim, Germany (Maylath et al., 1989) and in the United States, such as in Lancaster County, Pennsylvania (Dear, 1977) and Chicago (Rowitz & Levy, 1968; Daich, 1981, cited in Philo, 2005). The overall findings of these studies generally tend to support Faris and Dunham's original study in Chicago (Hudson, 2012; Philo, 2005) on the spatial distribution of people diagnosed with schizophrenia, showing higher concentrations of individuals with schizophrenia in inner cities. Concurrently, these studies highlighted that this urban gradient is specific to schizophrenia, other conditions being more randomly distributed (Philo, 2005, Holley, 1998).

As pointed by Philo (2005), the quantitative rigor of these studies allowed researchers to describe spatial patterns of the distribution of mental health across cities, but “such studies do not necessarily succeed in explaining in any great detail the causal mechanisms involved in generating such patterns” (McGeachan & Philo 2017, p. 35). In essence, “the finding was that the more ‘stressful’ the local socio-economic environment, as usually associated with the most run-down built environments, the more likely it was that a neighbourhood would generate large numbers of admissions” (Philo, 2005, p. 586). However, due to the quantitative nature of this research strand, the “stressful” dimension pointed by Philo has not been grasped – in those studies – from an emic perspective. Hence, by showing the spatial variability of mental illness/health within a city, such ecological studies highlighted the need to “take into account more contextual factors characterizing their immediate environment of living and working” (Philo, 2005, p. 586), for a better understanding of the prevalence of psychosis.

(iii) Mental health provision and care is the third strand of research in the geography of mental health. Also referred to as “asylum geographies” (Wolch & Philo, 2000, p. 138), this strand is interested in the geographies of mental health services, adopting different geographical and historical scales for analysis, in order to “cast light on the complex geographies of madness and societal responses to it” (McGeachan & Philo, 2017, p. 37). Adopting a historical perspective anchored in Michel Foucault’s work on the history of madness and his interest in disciplinary spaces, Philo provided extensive and detailed investigations into the advent and the conception of asylums in Great Britain (Philo, 1986; Philo, 1987; Philo, 1989; Philo 1997; McGeachan & Philo, 2017). This body of work discusses how discourses in medical, political and economic milieus have helped shape policies aimed at the isolation – both spatial and social – of individuals deemed ‘mad’ (Mcgeachan & Philo, 2017). Philo considers that

> [Asylums] speak of grand medical and moral visions about cure and kindness, albeit a high ground not always reached in practice, and hence they also speak of incarceration, loneliness, abuse and despair. They are painful windows into the soul of a past social order, illuminating what the experts of the time understood to be the divisions between the ‘sane’ and the ‘insane’, ‘reason’ and ‘madness’, those to be welcomed and those to be shunned. (Philo, 2014, as cited in Mcgeachan & Philo, 2017, p. 37).

Mental health service provision underwent major changes from the mid-twentieth century onwards, with the process of deinstitutionalisation, which was made possible by the discovery of psychiatric drugs (Rose, 2018). Deinstitutionalisation refers to the progressive abandonment and replacing of asylum-like structures and large psychiatric hospitals devoted to the long-term stay of patients in favour of less isolated, small-scale community-based mental health services, with services located within cities, or patients being cared for at home. Geographers became interested in the spatial and social consequences of this process, developing what is sometimes referred to as “post-asylum geographies” (Philo, 2005). Research in this vein remains largely focused on urban rather than rural areas (Mcgeachan & Philo, 2017).

Important work in this line of research includes Dear and Wolch’s *Landscapes of despair* (1982) and Dear and Taylor’s *Not on Our Street* (1982). Dear and Taylor investigated community reactions and attitudes towards these new services located within certain neighbourhoods in Toronto and identified a “not in my backyard” attitude towards these facilities, most notably in middle-class suburbs (Philo, 2005; McGeachan & Philo 2017). On the other hand, Dear and

Wolch critically examined the effects of deinstitutionalisation on the patients themselves and identified "a trend towards deinstitutionalized ex-patients slipping through the care net into new spaces of homelessness, poverty, drug dependency and even *re*institutionalization through the penal system" (Philo, 2005, p. 588). Shifting attention from large-scale institutions towards more individual trajectories of deinstitutionalisation, the human subject became more central in this third strand, with researchers being "interested in the micro-level of individuals interacting with treatment settings and landscapes" (Philo & Wolch, 2001, p. 233). These studies highlight the challenges faced by these new policies.

(iv) The notion of *landscapes* becomes central to the fourth and last research strand in mental health geography identified by McGeachan and Philo (2017) with the concept of "therapeutic landscape", first introduced by Gesler in 1991 in *The cultural geography of health care.* Under the impulse of the 'cultural turn', geographers took greater interest in the micro-level and in persons, becoming more attentive to individual human perceptions. Hence, this research steers away from spatial patterns of the distribution of mental disorders, to more interpretative approaches (Philo & Wolch, 2001). Here the geography of mental health engages with questions of difference, identity and everyday life (Philo & Wolch, 2001), as well as with the dense and complex enmeshment of these aspects. This strand of research aims to understand "how people with mental health problems negotiate the spaces and places all around them: facilities, housing, shops, streets; squares and parks; neighborhoods, cities and regions (also Kearns, 1986; 1987; Kearns & Taylor, 1989)" (Philo & Wolch, 2001, p. 236). Much of this research is interested in the subjective and interrelated components of these activities, i.e., how patients feel in different places and the impact of these spaces on mental health:

> How do they feel in these spaces and places, 'at home' or not, 'in place' or 'out of place'? Do they experience hostility or tolerance from other people present there? What is it that renders some locations attractive, calming, supportive and the like, and what is it that renders others less appealing and even frightening? (Philo & Wolch, 2001, p. 236)

The concept of therapeutic landscapes – defined by Gesler "as a geographic metaphor for aiding in the understanding of how the healing process works itself out in places (situations, locales, settings, milieus" (1992, p. 742) – aimed at a better understanding of the interconnections between health, place and identity (McGeachan & Philo, 2017). Oriented towards health promoting aspects of the relation between health and places, the therapeutic landscape framework ignored the potential negative effects of places on health until more recently[8], when critics argued that "places can be simultaneously healthful and hurtful" (Williams, 2010, p. 217), and that there are "non-therapeutic landscapes" or even "counter-therapeutic landscapes", the latter of which are argued to be more active (McGeachan & Philo, 2017). Thus, mental health geographers interested in the link between psychosis and cities emphasise the restorative potential of urban environments (see Söderström et al., 2017; Baumann et al., 2020; Codeluppi, 2019), with little attention paid to the detrimental aspects of cities for people with a history of psychosis. As a result, within the framework of therapeutic landscapes, urban mental health geography was less oriented towards the etiology of mental illness in general, and to the potential mechanisms that link urban environments to psychosis more specifically.

[8] For a thorough review of the evolution of the concept of therapeutic landscapes, see Williams (2010).

After having briefly reviewed these four trends, it is apparent that mental health geography in general, including the work interested in the link between cities and psychosis, is not so much oriented towards etiological questions, be it for methodological or epistemological reasons. As a matter of fact, recent geographical approaches to the incidence and prevalence of psychosis in cities stem rather from the psychiatric field. Indeed, psychiatry has produced an increasing number of works on the relationship between cities and psychosis since the 2000s. Before dissecting this recent strand of research (in section 2.3.6), the next section discusses the reasons why this body of work has been increasingly popular since the 2000s in psychiatry, and not earlier.

2.3.5. Urban mental health in Psychiatry: a story of separation and reconnection

Despite the early acknowledgements of the entanglement between urban environments and psychosis discussed in the previous section, the topic only received sustained attention within psychiatry during the 1990s. Historicising the way psychiatry has addressed the urban allows me to highlight paradigmatic shifts within the discipline that explain the revived interest in the urban question at the end of the 20th century, as well as examine the role of the social determinants of mental health in this trajectory. This will then lead to the review of recent literature in psychiatry on the relation between urbanicity and psychosis.

In the following, I discuss the reasons for both the disappearance and the re-emergence of this topic in the early 1990s. Those reasons are complex, but I focus the discussion on two key factors that are of importance for my narrative: (i) the adoption of a biological model of mental health in psychiatry in the postwar era, and (ii) the transition from a medical to a social model in public health.

Separation

The first reason for the decline in the interest in the urban question is the relatively rapid and profound transformation that postwar psychiatry experienced in its understanding of mental illness in general, and of psychoses and schizophrenia more specifically[9]. While social, behavioural and environmental determinants were dominant in the etiology of mental disorders before WWII, mainstream psychiatry turned towards a biological understanding in the decades following the war.

At the end of WWII, environmental and behavioural models of mental disorders, informed by sociological thinking, were dominant in American psychiatry (Mayes & Horwitz, 2005). The first edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-I*), published in 1952, embodied a dynamic psychobiological conception of the nature of mental disorders in general, as well as of schizophrenia, underpinned by Adolf Meyer's approach to mental illness (Rose, 2018), a leading figure in the discipline at the time:

> Etiological models of schizophrenia have proposed a critical role for social factors since the earliest epoch of schizophrenia research, when Adolf Meyer's psychogenic theory

[9] For the following discussion, I greatly (but not exclusively) draw on the work of Nikolas Rose, who critically examines the history of psychiatry (Rose, 2018).

> described the illness as a maladaptive response to environmental influences and life experiences (Meyer, 1910). (DeVylder, 2012, p. 479).

Diagnostic categories were not central to this approach, and symptoms or psychiatric disorders were conceived as "individual *reactions* to particular adverse situations, themselves dependent on the ways in which the biological and physiological constitution of each individual had been shaped by life history" (Rose, 2018, p. 78, emphasis added). It is at that time that the first antipsychotic drugs were discovered (by accident) and administered within psychiatry, and with them came the discipline of psychopharmacology. Although the mechanisms of action of those drugs were unknown (and still are not entirely understood today), it was apparent that the location of their action was the brain (Rose, 2018). The fact that psychopharmaceuticals have effects on the brain laid fertile ground for the idea that mental disorders where brain disorders, that mental disorders were located within an individual and of a biochemical nature, rather than resulting from an individual's life history or in his or her relations with the (social) environment – a conception that prevailed at this time, and that was crystalised in the use of the term '*reaction*' in the *DSM-I* (Rose, 2018).

With the revision of *DSM-I* to *DSM-II* published in 1968, the term *reaction* was entirely removed from the manual. The argument for this was to "avoid terms that carry implications about the causes of a disorder" (Rose, 2018, p. 79), since the *DSM* was a diagnostic manual. Rose, however, considers that this was only "to foreshadow the major epistemological and ontological shift that would lead to publication of *DSM-III* in 1980" (Rose, 2018, p. 79), which would radically transform the nature of mental illness (Mayes & Horwitz, 2005). This shift was a move away from mental disorder understood as "*reactions* of an individual with a particular biological and physiological make-up to the stresses generated by his or her experiences" (Rose, 2018, p. 78, emphasis added) towards an entirely new system of classification. According to this new conception, mental disorders are to be considered as disease entities that reveal themselves in symptoms which must be captured by diagnosis (Rose, 2018, p. 80). Underpinning this categorical conception of diagnosis, we find the idea that there are distinct psychiatric disorders with distinct set of symptoms, which can be separated from one another, and that "a diagnosis would identify a specific underlying biological substrate for each unique condition, which if not the sole cause of that condition, was an 'obligatory passage point' for its emergence" (Rose, 2018, p. 80). Hence, from the second part of the 20th century onwards, research in the etiology of mental disorders is progressively colonised by a biological way of thinking, to become dominated by a "bio-bio-bio model of madness" (Read, 2005), where ecological factors – social and environmental determinants – were less and less considered. Regarding schizophrenia, major advances in genetic research and biochemistry supported a biological model:

> The recent explosion of knowledge in genetics and the neuroscience, however, has strengthened the belief that just around the corner lies the vital new finding which will uncover the precise determinants of those unwanted and incomprehensible behaviors that lead some individuals, under some conditions, to be diagnosed as suffering from schizophrenia. (Cohen & Cohen, 1986, p. 12).

After this shift, the number of etiological studies of schizophrenia looking into psycho-social determinants became marginal (Read et al., 2009, p. 299). As a consequence, interest within

psychiatry in the social context in general, and urban environments more specifically, in the etiology of psychosis declined:

> […] we abandoned ecological studies concentrating our effort on individual approaches in the 1970s; with the demonstration that schizophrenia was a biological brain disorder, we thought that its causes, effective treatments, and prevention strategies would also be biological and lie at the individual level and assumed that differential rates across neighborhoods were due to social (selection) drift. (Allardyce & Boydell, 2006, p. 592).

The second reason for the disengagement of psychiatry with the urban hypothesis has to do with the progressive distancing of the disciplines of urban planning and public health. The epidemic events to which cities were confronted during industrialisation and the concurrent urbanisation discussed above, "forged a path for a global shift in perspectives on the synergies between urban planning and public health" (Williams, 2013). At that time, environmental determinants of health were put on both public health practitioners' and urban planners' agendas. With these two disciplines joining forces, urban planning became a public "health response to the poor living conditions in the urban settlement of the early industrial era" and the health risks associated with it (Frank & Kavage, 2008, p. 214). The Hausmannian model of city planning, as well as the functionalist model of city planning for example, were central at that time and both aimed at improving living conditions (Duhl et al., 1999, p. 3). The Hausmannian model of city planning, which focused on the rethinking and rebuilding of water supply and sanitation systems such as sewers, was meant to prevent new outbreaks of infectious and communicable diseases (Kochtitzky et al., 2006). The zoning regulations of the functionalist model of city planning, based on the idea of dividing up residential and industrial functions in the city, meant to protect residents from exposure to industrial pollution (Kochtitzky et al., 2006). Consequently, during the 19th century, the disciplines of public health and urban planning were closely aligned – linked by a social model underpinning their understanding of their roles and purpose, one that "considers health as an outcome of the effects of socioeconomic status, culture, environmental conditions, housing, employment and community influences" (Duhl et al., 1999, p. 7). However, from the 1930s onwards, public health adopted a new rationale and understanding of its role and drifted away from this model. Confronted with the limits of humanity's ability to control all pathogens, public health left aside the environmental dimension to focus on the individual (Duhl et al., 1999). Public health transitioned from a social model towards a medical model (Duhl et al., 1999, p. 5-7) and focused on the interventions necessary to prevent and treat disease at an individual level, such as vaccines. Following this shift, the two disciplines went separate ways for the greater part of the 20th century:

> Despite these critical acknowledgements of the built environment-health link in the 19th century, momentum slowed on the "healthy city-building" agenda as both professions shifted their focus elsewhere. Both reverted to professional silos: planning grew increasingly preoccupied with economic development (infrastructure and transportation projects) and environmental protection, while public health focused on individual lifestyle behaviours (exercise, smoking and diet), infectious disease as well as substance abuse and dependence. (Williams, 2013, p. 6, reference omitted).

The disciplinary formalisation and paradigmatic shifts in psychiatry and public health – in both cases, a drift away from a social understanding of their respective subject towards a biologically

informed approach – contribute to explaining why the 'urban hypothesis' of psychosis had not been investigated more intensively after Faris and Dunham's pioneering study prior to the 1990s. An additional reason "that the environment has received less attention than genes is the difficulty in measuring this construct and in relating environmental measures to risk of schizophrenia" (Brown, 2011, p. 26).

Reconnection

Having discussed some of the reasons explaining why this topic has been eluded in research for several decades, we now explore why the relationship between psychosis and cities re-emerged towards the end of the 20th century and has since received more attention. In short, this re-emergence can be attributed to a return to the once prominent ecological and social approach to mental illness in general, in both psychiatry and public health.

First, in the case of psychosis, the biological (and especially genetic) model of schizophrenia was not unquestioned, although it remained dominant from the 1960s onwards. The famous twin studies by Gottesman conducted during the 1970s are interesting here, as the exact same study results have been used to advance diametrically opposed interpretations and conclusions on the importance of biological and/or environmental determinants of psychosis. These studies showed a concordance rate of 48% between monozygotic twins (who share 100% of their genes) – meaning that if one twin is diagnosed with schizophrenia, the second has less than a fifty-fifty chance to be diagnosed as well – compared to 17% for dizygotic twins (who share 50% of their genes). These results have been taken as evidence both (a) *for* and (b) *against* the importance of genes in the etiology of schizophrenia, both *for* and *against* the dominant biological model of psychosis:

> a) The basic intuition behind the twin studies is the following: given that MZ twins (sharing 100% of their genes) and DZ twins (sharing 50% of their genes) share the environment they are raised in, higher concordance rates in MZ over DZ twins most likely result from genetic similarity. (Henriksen et al., 2017, p. 2).
>
> b) […] because the suspected genetic anomaly does not produce effects (culminating in the acquisition of the diagnosis by a co-twin) in over half of the cases where a monozygotic twin is diagnosed as schizophrenic, Stromgen (1975) as well as others claim that the only unquestionable result of twin genetic studies is that they demonstrate the extensive contribution of 'environmental' factors to the etiology of the disorder. (Cohen & Cohen, 1986, p. 15).

Consequently, while advances in genetics precipitated research towards a biological model of the etiology of schizophrenia, pushing aside socio-environmental and psychological factors that were once considered important, it is also genetic research – or, to be precise, its limits – that re-opened the door for environmental factors in the search for the causes of psychosis:

> The fact that is less frequently discussed, however, is the 40-55% discordance rate for schizophrenia cases who share identical genes. Although stochastic mechanisms have been invoked to account for this high rate of discordance, the most plausible explanation is for a role of environmental factors. (Brown, 2011, p. 26).

Although interest in socio-environmental determinants receded during the decades of domination of biological thinking in psychiatry, research in this domain, and more precisely in the link between urban environments and psychosis, did not entirely disappear. There are indeed

a handful of studies in psychiatry approaching the topic during that time (see, e.g., Hardt, 1959; Hare, 1956; Klee, et al., 1967; Levy & Rowitz, 1970, 1973; Lewis et al. 1992). Towards the 1990, this strand of research focused mainly on the relationship between migration and psychosis (see Freeman, 1994; Freeman & Alpert, 1986), which, over time participated in reviving "interest in the role of social context in the etiology of psychosis" (March et al., 2008, p. 86).

The renewed interest in social determinants of mental health at the end of the 20th century is not specific to psychiatry. Actually, it is part of a widespread theoretical and empirical re-engagement with contextual factors of health, as well as health and place interaction, that took place in epidemiology in general, as well as in the social sciences, in the 1990s (Cummins et al., 2007; Williams, 2013). This trend also informed the discipline of public health. In the context of rapid urbanisation and globalisation during the 1990s, cities emerged as adequate actors to address these social determinants of health, both on a local and global scale (Grant et al., 2017), "because of the breadth of their responsibilities over a defined geographical area, with powers cutting across different areas of public policy" (Naylor & Buck, 2018, p. 9). In 1988, the Healthy Cities Movement, "whose purpose is to strengthen the role of cities in achieving health for everyone" (Duhl et al., 1999, p. 30), was set up by the WHO Regional Office for Europe and with it, the disciplines of public health and urban planning were reconnected (De Leeuw & Simos, 2017). The healthy city movement helped develop "a strong understanding that the prime determinants of health status are social and economic conditions" (Duhl et al., 1999, p. 1) and commissioned the report published in 1998 under the name "*The social determinants of health, the Solid Facts*" by the World Health organisation (WHO) (Dixon, 2000). This report, published in 1998, captured this move away from the medical model of health back towards a social model in public health. The text outlines the contribution of psychosocial and material factors the health – such as unemployment and socio-economic status, social exclusion, stress, work, etc. – and made "a strong but easily understood case for the various ways in which material disadvantage combines with the effects of insecurity, anxiety and lack of social integration to affect the health of those at progressively lower levels of socio-economic status" (Dixon, 2000, p. 87). While the medical model focused interventions on the individual and on the treatment of disease, the social model considers health in a broad sense as resulting from socioeconomic, environmental and community influences. In this conception, intervention is underpinned by an environmental approach:

> The underlying concepts of environmental theory focus on the physical and social constructs of communities. The theory holds that significant numbers of diseases are caused by toxins in the environment, and implies that disease prevention, instead of requiring individual personal changes or medical treatments, demands changes in our surrounding environments. Further, the environmental hypothesis points not only to chemicals, but also to the physical environments and social organization under which people live. (Duhl et al., 1999, p. 8, references omitted).

Concurrently, the WHO advocated a public health approach to mental health, insisting on the need for a "new understanding" of mental health, where mental disorders are understood as the results of an interaction between biological, psychological and social factors (WHO, 2001). And a decade later, in 2014, the World Health Organisation published a seminal report entitled "Social Determinants of Mental Health", which insists on the role of the social, economic and

physical environments in which people live in shaping mental health and many mental disorders (WHO, 2014). Its key messages comprise the fact that social inequalities are associated with increased risk for many mental disorders, and that actions to improve the living conditions in daily life represent opportunities to improve mental health (WHO, 2014). In addition, the report points to a bidirectional association of mental health disorders and social determinants, "as poor mental health can aggravate personal choices and affect living conditions that limit opportunities" (Alegría et al., 2018, p. 2)

However, the fact that social determinants of (mental) health gained renewed interest in etiologic research in psychiatry during the 1990s does not mean that biological investigations slowed down. In fact, quite the opposite is true. With regard to psychosis, the ratio of biological studies to psycho-social studies interested in the etiology of schizophrenia reached 13.3 to 1 for the period before 2000, it grew to 20.6 to 1 for the period between 2000 and 2009, for a global ratio of 16 to 1, as mentioned above (Read et al., 2009, p. 300). Furthermore, the trend has not lost momentum since, considering that "[i]n the last decade, genetic research in schizophrenia has experienced a new dawn infused by a regained optimism due to newly developed, far more advanced molecular, technological and statistical methods" (Henriksen et al., 2017, p. 1).

To sum up, despite the systematic and critical acknowledgements of the relationship between urban environment, social determinants and psychosis, coming mainly from sociology and geography – but also from psychiatry, where a few studies approached the topic from a similar perspective – the "once-prominent social emphasis in etiologic research receded alongside a sharpening focus on biologic underpinnings" (March et al., 2008, p. 86) from the 1960s onwards and with it the interest in the role of cities, only to re-emerge during the 1990s. Urban mental health questions – and the relation between psychosis and cities among others – then received renewed interest from psychiatry in the context of the re-integration of social determinants of health in both psychiatry and public health. Having discussed some of the reasons for the separation and reconnection of the urban-psychosis nexus, the next section outlines the main lines of research on the city/psychosis nexus within the more recent literature in psychiatry.

2.3.6. Urban mental health and psychosis in Psychiatry

The vast majority of the recent studies on the incidence and prevalence of psychosis in cities stems from psychiatry, where the urban phenomenon has been captured by the neologism of *urbanicity*. Thus, in this section I review this literature in order to provide an overview of the major findings and lines of investigation. First, I situate research on the topic within socio-ecological models of mental health. Then, I provide a brief state of the art of critical contributions, highlighting how epidemiological studies showed consistent association of psychosis risk and urban living (for recent systematic reviews see Fett et al., 2019; Heinz et al., 2013; Kelly et al., 2010). Following that, I stress the limits of an epidemiological approach to the understanding of the mechanisms that link cities to psychosis. Eventually, this leads to the identification of the specific contribution of a geographic perspective on the subject, presented in chapter 2.4.

Etiology and psychosis

With the progressive re-acknowledgment of the critical role of environmental and social factors, research in psychiatry today generally agrees on the multifactorial origins of schizophrenia (Stilo & Murray, 2019). Schizophrenia and other psychoses are considered to be the result of a complex interaction of biological, psychological and socio-economic determinants. Socio-ecological models of mental health are interested in the interplay between these aspects in their understanding of mental disorders. Different models – elaborated initially during the 70s and 80s, and constantly updated since – propose to integrate biological, psychological and socio-environmental aspects, among which we find the vulnerability-stress model and the bio-psycho-social model. The vulnerability-stress model (also called diathesis-stress model), first introduced by Zubin and Spring in 1977, unites different approaches and provides a useful framework for understanding the onset and relapse of psychoses (Zubin & Spring, 1977). This model posits that the onset and/or relapse of psychosis results from the interaction between individual/constitutive factors of vulnerability and external/environmental factors of stress. Psychotic symptoms emerge once the external stressors exceed a person's capabilities to cope with them. The original model by Zublin and Spring did not reduce vulnerability to biological determinants but, because of the domination of biological and genetic models of psychosis during the second part of the 20th century, vulnerability was (and probably still is) largely understood as genetic in nature (Read, 2005). In such conception of the model, environmental determinants only play the minor role of trigger or exacerbator (Brown, 2011; Read et al., 2009).

Today, the vulnerability-stress model of psychosis comes with a variety of interpretations, where vulnerability is understood as psychological, cognitive, situational or experiential, and can be acquired "due to the influence of trauma, specific diseases, perinatal complications, family experiences, adolescent peer interactions, and other life events" (Zubin & Spring, 1977, cited in Read et al., 2009, p. 299). The bio-psycho-social model elaborates on such an understanding of vulnerability, and advocates for understanding social factors "as causal agents in the etiology of psychosis, rather than as mere triggers or exacerbators of an imaginary or, at best, grossly exaggerated genetic predisposition" (Read, 2005, p. 597). As such, it fore-grounds biosocial understandings – such as epigenetics and gene-environment interactions – of the etiology of mental disorders (Read, 2005).

According to socio-ecological models, mental health is the result of the entanglement of individual predispositions towards mental disorders – that can consist of genetic factors, socioeconomic conditions, lifestyle habits, demographic characteristics, traumatic events, etc. – and the socio-environmental context in which they live:

> The socio-ecological model furthermore suggests that the environment – subsuming built, natural, and social environments – serves as a background factor that can trigger, reduce, or amplify the risk of suffering from a mental disorder (Helbich, 2018, p. 129).

The association of urban environments and psychosis is embedded in such socio-ecological models of mental health – which enables the "integration across levels of social influences that may directly or indirectly serve as risk or protective factors for the individual, thereby contributing to the onset or prevention of a full psychotic disorder" (DeVylder, 2012, p. 478).

Among these environments, urban living – or *urbanicity* (the term used in psychiatry) – has been identified as a risk factor for psychosis. The next section briefly reviews the literature that highlights and confirms this association within psychiatry.

Urbanicity and psychosis risk, and the limits of epidemiology

From the 1990s onwards, rigorous comparative studies between urban and rural settings have established the higher prevalence of psychosis in urban settings, and many epidemiological studies have consistently established the association between *urbanicity* and psychosis (Allardyce & Boydell, 2006; Kelly et al., 2010; Mortensen, 2000; Pedersen & Mortensen, 2001a; van Os, 2004; Vassos et al., 2012). These studies took account of a great number of known risk factor and controlled for them (see Brown, 2011; Heinz et al., 2013). The effects of urbanicity refers to the association of risk for psychosis with population density (Fett et al. 2019) and "the impact of living in urban areas at a given point in time" (Vlahov and Galea, 2002). In these studies, *urbanicity* is generally approached through the categories of urban birth (see Mortensen et al., 1999; Laursen et al. 20017), urban upbringing (see Pedersen & Mortensen, 2001b; Krabbendam & Van Os, 2005) and urban residence (see Sundquist et al., 2004; Mckenzie et al., 2013). The variety of hypotheses suggested to explain the association between urbanicity and the risk for psychosis can be grouped into three categories, although they are interrelated (Kelly et al., 2010): (i) theories relating to pre-natal development, (ii) theories relating to urban upbringing and (iii) theories relating to societal and community environment:

(i) Consistent with a neurodevelopmental etiological model, disturbed pre-natal development has been suggested to affect the risk for psychosis in relation to urbanicity, due to obstetric complications, infections and low prenatal vitamin D, all of which have been found to be more common in urban environments to some extent (Kelly et al., 2010). This raises the hypothesis that urbanicity affects individual pre-dispositions towards psychosis, rather than acting merely as a precipitating factor (Kelly et al. 2010).

(ii) A number of studies have investigated the relation between urbanicity and the risk for psychosis during early life, suggesting that factors acting during childhood or early adulthood – such as household overcrowding, childhood socio-economic status, parental unemployment and low parental income or cannabis consumption – could mediate the relationship (Kelly et al., 2010). However, the effect of urbanicity prevails after controlling for these confounding factors. In addition, altered cognitive development has been suggested to be relevant for the link between urbanicity and psychosis, but the underlying causes for this process has not been identified, and therefore cannot explain the association (Kelly et al., 2010).

(iii) The relation between urbanicity and societal and community environment has been apprehended through "urban (social/economic) stress" or "social and economic stressors" (Fett et al., 2019). Among the various social and economic factors that may account for the relation between psychosis and urbanicity, migration and/or minority status shows the most consistent association (Fett et al 2019). The hypothesis that low social capital and/or social fragmentation may account for the association between urbanicity and psychosis (Kelly et al., 2010) is related to this observation. According to a review of recent literature, current evidence is mixed with

regard to other socio-economic factors, such as social deprivation, social isolation, unemployment, with no significant association found between psychosis and urbanicity in Europe when corrected for minority status and these socio-economic factors (Fett et al., 2019). In sum, "[s]ocial and economic stressors (e.g. migration, ethnic density and economic deprivation) […] could only explain part of the urbanicity effects" (Fett et al., 2019, p. 232). Furthermore, social and economic factors appear to be related to negative urban effects independent of population density (Fett et al., 2019).

Through the systematic description of spatial and temporal variations of the distribution of psychosis, descriptive epidemiology has generated various hypotheses for its association with urban living, but such an approach does not isolate specific environmental determinants responsible for the difference in prevalence and incidence rates:

> Many explanations have been proposed such as greater exposure to prenatal influenza, maternal obstetrical complications, toxoplasma gondii infection, cannabis use, social deprivation, income inequality, and social fragmentation but none of them has been verified. (Stilo & Murray, 2019, p. 2-3, references omitted).

Thus, despite the variety of hypotheses developed to explain the links between mental health and urban environments, as well as the identification of a wide range of factors associated with urbanicity that may potentially contribute to the development of psychosis, the exact mechanism involved in this association – the identification of why and how the social and built environment of cities participate in causing psychosis – remains unclear (Fett et al., 2019; Heinz et al., 2013; Helbich, 2018; Kelly et al., 2010; Manning, 2019; Peen et al., 2010). Major reasons for this limitation are to be found in the design of the studies that established the association. While the quantitative rigor of the spatial epidemiological studies highlight the association of psychosis and cities – or certain areas of a city – such an approach is limited in its aptitude to go beyond statistical associations between place characteristics and health outcomes (Cutchin, 2007) and hence to explain the association through causal mechanisms:

> There has been little work on the actual processes and mechanisms that may link specific characteristics of neighborhoods to the health of the persons who reside in them. Demonstrating that neighborhood environments are causally related to health will ultimately require showing that the purported processes through which neighborhoods could affect health are indeed operating. (Diez Roux, 2002, p. 517, renferences omitted).

One reason for this, concerning mostly early studies, is that, working on an area-level, "the lack of knowledge about individual-level characteristics can make interpretation problematic" (Holley, 1998, p. 537). This emphasises the risk of ecological fallacy, "whereby characteristics of aggregated regional populations might be used to generate inaccurate assumptions about individuals in the population" (Curtis & Rees Jones, 1998, p. 647). More sophisticated analytical procedures, based on multilevel modelling "called nested designs, i.e. individuals nested within space" (Helbich et al., 2017), have been used to examine further the association between individuals and neighbourhoods. One problem remains: they rely on "static conceptualizations of how place and environmental exposures are integrated, which is primarily done by means of administrative units thought to represent neighborhoods" (Helbich, 2018, p. 130). Such a conceptualisation of space and place assumes for example that neighbourhoods

are well-defined spatial areas and that city dwellers do not move in space-time over the course of their life and/or during their daily activities (Helbich, 2018).

> Yet, whereas traditional views of "neighborhoods" may give the illusion that contextual dimensions operate within fixed and well-defined local areas, a more comprehensive and dynamic understanding of place and space makes it clear that research questions cannot be handled with the classical nested structure design. Neighborhoods or local areas are most often operationalized with clear and tight boundaries, for example, using administrative or historical delimitations. A reason for this is that scientists often have access to data aggregated at these units. However, nesting individuals in areas with fixed limits do not always make sense, mainly because of discrepancies between the retained unit and individual's conceptual representation of "neighborhood" or individual's actual spatial behavior, which may be unrelated to the spatial unit of observation. (Kestens et al., 2017, p. 53.)

As highlighted above, the acknowledgment of urbanicity as a causal risk factor for psychosis has reinforced the idea that the social determinants of mental illness are key to the development of psychiatric disorders. Today, most "research in this field, identifies urban life with social factors as opposed, for example, to air/noise/light pollution" (Manning, 2019, p. 2). The identification of mechanisms remains problematic, however, because of methodological and conceptual limitations associated with spatial epidemiology. Within psychiatry, *urbanicity* is approached through the disembodied and fixed categories of *urban birth*, *urban upbringing* or *urban residence* and stress is often – if not always – apprehended through the static category of "social and economic stressors". The fact that a person is or was administratively registered in a city, does not give us any information about "whether she or he spends time in the city, or tends to avoid it, or deploys very selective forms of urban practice" (Söderström et al. 2016, p. 109). While spatial epidemiology provides support for the role of space and place in health (Cutchin, 2007), the static conceptualisation of place and the disembodied approach of urban living pose problems and are thought to be responsible for the limiting results of spatial epidemiology when it comes to understanding *why* and *how* the city affects mental health, and when it comes to identifying the mechanisms that explain the link between urban living and psychosis. Recently, stress has been suggested by the WHO (2014) as a pathway linking social determinants to mental ill health. I discuss this in more detail in the next section, focusing on relevant aspects concerning the city/psychosis nexus, and I point to the change in perspective needed to grasp urban stress.

Stress, psychosis and the city

Despite, or more likely because of, its popularity and prevalence in academic literature in multiple disciplines, stress remains an elusive concept (Robinson, 2018). More than anything else, stress has been characterised over the last 100 years by a "chaotic disagreement over its definition" (Mason, 1975, p. 6, cited in Rose, 2019, p.62), which challenges its utility and explanatory potential (Rose, 2019). It would be too ambitious to draw the full picture of the debates surrounding the notion of stress. Rather, I suggest the simple following question as a guide, for navigating in this maze: should we still use this concept or should we get rid of it or not?

It is argued here that it is still worth, especially in the context of a biosocial approach, to pursue efforts and work with and through the concept of stress, as it allows to build bridges between what is traditionally understood as belonging to ‘the biological’ and to ‘the social’, in that stress comprises both physiological and psychological aspects, ‘objective’ and ‘subjective’ dimensions of our relations to the environment. In the following, I propose a brief review of the history of the notion of stress in general, tracing the emergence of the term, before focussing of the relation between stress and (mental) ill health. The discussion then concludes by discussing the links between stress, psychosis and cities.

It is difficult to precisely identify the moment stress emerges as an object of inquiry and/or a concept, with various predecessors laying the groundwork for the concept of stress at the end of the 18th century (Hutmacher, 2021; for a review see Jackson 2013 and Robinson, 2018). Here, I discuss this emergence by means of four scholars often cited as central figures in the advent of stress research; Walter Cannon, Hans Selye, Richard Lazarus and Bruce McEwan.

Building on the work of French physiologist Claude Bernard and his interest in the *milieu intérieur*, Walter Cannon studied the organism’s stabilisation mechanisms (Robinson, 2018), and “proceeded to describe the process by which bodily systems have built an internal system, *a fluid matrix,* to help organisms maintain a stable internal state, which he defined as *homeostasis”* (Robinson, 2018, p. 336). This equilibrium, the homeostasis, was to be achieved after a body is exposed to an external stimulus (such as oxygen deprivation or changes in room temperature), according to Cannon, through the collaboration of two systems: the sense organs and the central nervous system (Robinson, 2018). Stress is here conceived as physiological adaptation of the biological body to an external stressor. Cannon subsequently complexified his model, incorporating psychological aspects to understand the reasons for internal physiological (dys)regulations, and proposed the basis of what is known as the ‘acute stress response theory’ or the ‘fight-or-flight response’ (Robinson, 2018). This theory proposes that, in case of a perceived threat, activation of the nervous system prepares the body to react to the danger, in mobilizing the necessary bodily resources. The chain of physiological reactions leads to physical signs, such as increased heart rate and breathing rate, which allow better oxygenation of the muscles. After such physiological arousal, the body recovers its initial internal sate. The idea of homeostasis, through the notions of ‘allostasis’ and ‘allostatic load’ continues to be used, also in the field of urban mental health, to think the pathways between urban living and psychosis (see Manning, 2019).

This theory served as a basis for Hans Selye, considered as the ‘father of stress research’, to develop his theory of the general adaptation system. While Cannon used the term *stress* in the title of one of his articles, he did not define it (Robinson, 2018). This is generally attributed to Hans Selye, who “defined *stress* as mutual actions of forces that take place across any section of the body, physical or psychological” (Robinson, 2018, p. 338, emphasis in original). The ‘general adaptation system’, also called ‘stress response’ proposed by Selye comprises three stages and relate stress to health:

> In the first stage, the alarm reaction, the body prepares to fight or flee. This is followed by a stage of resistance, where the body prepares for sustained attack against the stressor. In this second stage, the immune response continues to increase and the body adapts to the

> specific stressor. For example, if the stressor is nutritional deprivation, the body may become lethargic to conserve energy while the absorption of nutrients is maximized. In the third stage, exhaustion, the system becomes exhausted and resistance to the stressor cannot be sustained. Selye's central point was that the prolonged effect of stress would have a negative impact on general health. This observation was the beginning of an understanding of why stress, really distress, can be pathological and is the reason the word *stress* has earned such a negative association. (Robinson, 2018, p. 338).

This approach, and the work of one of his doctoral students on the hypothalamic–pituitary–adrenal (HPA) axis, laid the ground for thinking the harmful effect of stress, and especially of prolonged stress, on health (Robinson, 2018). Today, chronic stress, sometimes called 'toxic stress', is thought to be a pathway that may explain the link between urban living and psychosis (Adli, 2017; Rose, 2018) and the impact on urban living on the HPA-axis is one of the possible explanations of this link (Steinheuser, 2014; Manning, 2019). Selye's model is based on a positivist epistemology and oriented towards the search of general laws, where inter-individual differences in stress management are not accounted for (Robinson, 2018). It is with the interactional model of stress, proposed by Lazarus, that stress research gains new orientations.

While the two previous models of stress were elaborated mostly on the basis on animal studies, postwar research on stress, foregrounded psychological stress as "an important factor in the onset of certain psychopathologies and psychosomatic symptoms" (Robinson, 2018, p. 339), and "psychologists began to recognise that the simple stimulus–response explanation offered by Selye did not capture the dynamic of how a stimulus is interpreted as stressful" (Robinson, 2018, p. 339). In that vein, Richard Lazarus' research on stress challenges Selye's mechanistic approach, and opens a psychological perspective on stress:

> Lazarus argued that what makes psychological stress unique is that it involves personal meaning, or appraisal, as well as emotions. […]. This highlights the importance of individual appraisal, because one individual may interpret an environmental situation as innocuous, whereas another may perceive the same situation as stressful. (Robinson, 2018, p. 339).

Lazarus argues that events or situation are not stressful per se, but that stress depends on the individual appraisal of a situation. In other words, one "person's stress, to be avoided, was another's excitement, to be actively sought" (Rose, 2019, p. 61). What might seem trivial, was, at that point a major questioning of Selye's physiological dominant model of stress. In other words, what seemed true for animals, was not for human beings: "[f]or human beings, stress was, it seemed, not objective, but a subjective response to particular objective circumstances" (Rose, 2019, p. 61). Lazarus expanded his model together with Susan Folkman, during the 80's, by introducing *coping* as a central mechanism in the explanation of what becomes stressful for an individual. Here coping refers to the strategies an individual develops, such as thoughts, behaviors and attitudes, to control and manage a potentially stressful situation. Bister and her colleagues introduce the notion of 'niching' to explore the 'practices of rendering urban assemblages habitable' (Bister et al., 2016, p. 212) and the related ecological aspects, taking a critical distance with the term 'coping' used in psychiatry:

> The psychiatric discourse speaks of 'coping'. Yet we have difficulties with this term's individualistic and cognitive connotations. We instead consider 'rendering habitable' a set

> of practices with an individual cognitive and affective component, but still embodied and heavily embedded in social contexts and material environments.

The various ways people living having experienced a first episode of psychosis and persons living with psychosis navigate through the complexities of urban environments are investigated today in geography and anthropology, often through ethnographic methods (see Söderström et al., 2017; Codeluppi 2019; Bister et al., 2016; Richaud & Amin, 2019).

Progressively sidestepped during the second half of the 20th century in the analysis of the relationship between the physical and social spaces of urban areas and the mental health of urban dwellers, stress was revived in the 1990s (Rose, 2020). McEwan's understanding of stress played a significant role in this revival (Rose, 2020). In a series of articles, McEwan (McEwan and Stellar 1993; McEwan 2012; 2013) conceptualised stress as an intertwined 'state of mind', linking body, brain and social environment on the one hand, using the metaphor of "how the social environment gets under the skin" (2012). On the other, in an article entitled "Stress and the individual: mechanisms leading to disease" (1993), he and Elliot Stellar linked stress to ill/health outcomes, through biosocial processes. They suggested that experiences of stress can lead to 'allostatic load' – understood as 'strain on the body produced by repeated ups and downs of physiologic response [to stress] as well as by the elevated activity of physiologic systems under challenge, and the changes in metabolism and the impact of wear and tear on a number of organs and tissues' – which in turn could impact ill/health. Such understanding of stress foregrounds the enmeshment of biological and psychological aspects of stress, which is of particular interest when trying to develop a biosocial approach.

While this brief historical overview allows tracing the emergence of stress research and highlighting links with (mental) health and identify origins of current interest in the stress hypothesis relating urban living to psychosis, it entails the risk of giving a false idea of a rather homogenic field of research. As mentioned above, quite the opposite is true. During the twentieth century, stress has been the site of multiple interests and inquiries, from various disciplines, ending up in a general picture of stress and stress research that is difficult to grasp. Hans Selye said, almost fifty years ago, that "everyone knows what stress is" and also "no-one knows what it is" (Selye, 1973, p. 692, cited in Rose and Fitzgerald, 2022, p. 131), and this seems to be still true today. Rose and Fitzgerald identify the crucial questions that the notion of stress rises:

> Is my stress like your stress? Is stress a result of objective features in the world, or a subjective experience? Is stress a psychological experience or a set of biological processes—or both? Can one speak of stress in the singular, or are there multiple different experiences that can be 'stressors' dependent on one's culture or personality? Is there any experience that cannot be stressful for some people, at some times? Debates about these questions have continued for at least a century. (Rose and Fitzgerald, 2022, p. 131).

This raises the question of the usefulness of the notion of stress itself (Rose, 2019). However, across the variety of definitions, stress seems to incorporate three core aspects, according to Hutmacher (2021), that result from the discussion held above: (i) the notion of stress refers generally to a sense of overwhelming, connoted in a negative way, when "*things are getting too much and out of balance*" (Hutmacher, 2021, p. 2, emphasis in original). This relates to the ability to cope with events and/or situations. (ii) Stress is constituted by the inextricable

combination of physiological and psychological factors. (iii) In addition, Hutmacher critically discusses the universality of stress, as a third characteristics of stress. Rose and Fitzgerald formulate similar ideas, although insisting on the shifting biological substrates of stress:

> Across these debates, that word, 'stress,' and its cognates have kept their resonance in the everyday language of emotions in almost all countries, even as the biological meaning accorded to stress is constantly reformulated in the course of research. (Rose and Fitzgerald, 2022, p. 13

Despite these shifting biological understandings, it is precisely the twofold dimension of stress, both psychological and biological, that allows to continue to think of stress as an interesting candidate for continuing to try to understand the entanglement of biology and environment (Rose et al. 2021). It remains "a potent way of pulling together the biological, the psychological, the social, the biographical, and the experiential" (Rose and Fitzgerald, 2022, p. 131) in the pursuit of trying to better understand mental ill health in on the one hand, and psychosis and its links with urban living on the other.

The WHO report 'Social Determinants of Mental Health' (2014) points to various reviews showing consistently strong association between education, food insecurity, housing, social class, socio-economic status and common mental disorders, and insists on the role of "stress" and "stressful experiences". Thus, this report highlights the importance of the circumstances in which people are born, raised and in which they live – which are shaped by wider socio-political forces – when it comes to mental health questions. As pointed out by Rose (2020), the report also suggests that the mechanisms by which adverse living conditions and various other disadvantages translate into mental disorders are stress and stressful experiences:

> The WHO report does rise to the challenge of mechanisms, however, suggesting that the mechanism that translates these diverse forms of disadvantages to mental distress is 'stress', especially prolonged and unrelieved, or 'toxic' stress (Rose, 2020, p. 38)

With regard to psychosis, a recent special issue entitled "stress and Schizophrenia" published in *Schizophrenia Research* in 2019, attests both of this current interest in the etiological role of stress, as well as it highlights the variety of the ways stress is explored in relation to mental health and psychosis:

> Heightened experience of stress is characteristic of psychotic disorders, and theories of psychosis etiology typically include some role for stress in the onset of symptoms. Associations between stress and psychosis have been examined and well-replicated using various methods of defining both stress (e.g., life events checklists, ecological momentary assessments, stress induction) and psychosis (e.g., schizophrenia, first-episode psychosis, clinical high risk, psychosis proneness). (Devylder et al., 2016, p. 1353).

Considering that "[e]pidemiological research has shown that stressful environmental factors can play an aetiological role in the development of psychosis" (Collip et al., 2009), that urban living has been established as a risk factor for psychosis and that urban areas are commonly described as stressful, *stress* or *urban stress* has been advanced as a plausible hypothesis relating psychosis to cities, where the "general stress and precarity of urban living create the psychosocial basis for the development of clinical problems" (Li et al., 2019, p. 19).

Insights from (i) neuroscience and (ii) gene-environment research produced interesting evidence on the pathways through which urbanicity may affect stress levels. First, urban living and urban upbringing have both been found to affect neurological responses to stress (Lederbogen et al., 2013; Lederbogen et al., 2011). Researchers have indeed observed an overall higher sensitivity or an over-responsiveness to social evaluative stress in participants with histories of urban living (Lederbogen et al., 2011). Second, it has been suggested that "[u]rban upbringing may increase psychosis risk through stress sensitization, mediated by gene-environment interactions with dopamine genes" (Fett et al., 2019, p. 239). Sensitivity to stress is an important aspect currently investigated in relation to the emergence and exacerbation of psychotic symptoms, and has been integrated in the diathesis-stress model discussed above as well as in other etiological models (DeVylder et al., 2016). Stress sensitisation refers to the process whereby "repeated exposure to severe psychosocial stress increases the behavioral, neurochemical, or psychometric responses to a later exposure of a new psychosocial stressor, even if this later exposure is not as severe as the previous one(s)" (Van Winkel et al., 2008, p. 1196), and is thought to play an important role in explaining how urbanicity may increase the risk for psychosis (Van Winkel et al., 2008)[10]. For methodological reasons, these approaches fail to provide a temporal and spatial analysis of the situated experience of persons living with psychosis within an urban environment.

Stress, then, remains an interesting candidate to research the pathways and mechanisms that link urban living and psychosis (Rose, 2020), in developing a neurosocial approach to urban mental health (Rose and Fitzgerald, 2022)[11]. As discussed, stress is thought to be a plausible hypothesis linking urban environment or urban living with psychosis. While it is recognised that certain socio-environmental factors (such as urbanicity, but also ethnic minority status) are associated with psychosis (Van Os et al., 2010, Morgan et al., 2010), the underlying mechanisms remain elusive, and 'the psychological mechanisms underlying an individuals' subjective experience of these factors in daily life are poorly understood' (Reinighaus et al., 2016, p. 713). Elevated sensitivity to stress, "characterized by intense emotional reactions to minor stressors and routine daily hassles" (Reinighaus et al., 2016, p. 713), is one of the most prominent mechanism being currently investigated, and it is a line of thought that may explain the link between urban living and psychosis:

> "Some individuals may experience stronger emotional reactions to unpleasant neighbourhoods and, thereby, develop more intense psychotic experiences" (Reinighaus et al., 2016, p. 713).

However, there are numerous problems with the way stress and (urban) stressors are defined and operationalised (Birk, 2021). For example, while such lab-based research shows that people with a history of urban living handle artificially induced social stress differently than those with no urban living history, they have been criticised by social scientists because they do not work on and/or identify *urban stress*. This does not mean that such results are irrelevant. However, they call for new and more fine-grained empirical attention to what urban stress might be from the point of view of persons living with psychosis (Bieler, 2021a). I discuss the need for a

[10] These aspects are discussed in more detail in the second peer-reviewed paper chapter 3.2
[11] See Rose and Fitzgerald (2022) for a thorough review of stress and its relation to mental health.

change in perspective on urban stress in the next section. The way stress is operationalised in this research is discussed by means of the second article (Chapter 3.2).

From exposure to experience

As highlighted above, new considerations of stress and the WHO report on the social determinants of mental health which suggests stress as a pathway for social determinants to become deleterious for mental health, revived stress as a crucial mechanism that links urban living and mental ill/health (Rose, 2020). Research in neuroscience and gene-environment interaction provide supporting evidence for this hypothesis. However, spatial epidemiology and lab-based research are limited methodologically and conceptually in their ability to identify mechanisms, and fail to provide ecological accounts of stress, leaving aside the mobile, dynamic and experiential dimension inherent to urban living. Such an approach carries the idea "that 'the city' is a set of material things and social characteristics to which persons are exposed" (Söderström et al. 2016, p. 109), and hence, cannot account for how people actually experience their living conditions. Urban living and its social aspects remain a black box within such approach[12]:

> There is almost no discussion of mechanisms to be found here, and the 'social' is actually measured in some very mundane ways, usually by employment, education, income, or social ties, with no real unpacking of what 'social' experience means in any detail (Manning, 2019, p. 5).

The psycho-social factors associated with an increased risk for psychosis are considered to primarily fall in the domain of 'relational stress' (Read et al., 2009) or social stress (Adli, 2017). It has been argued that, in order to provide a more fine-grained account of the entanglement of cities and psychosis, we need to move beyond epidemiology and 'unpack' the city through an experience-based approach (Söderström et al., 2016). To do so, a change of perspective is needed:

> The different sources of stress […] are related to the various dimensions of the city seen from a first-person perspective (Lysaker and Lysaker, 2008). As described by our respondents, the city is a milieu encountered as a demography, a morphology, a sensory 'climate', and a world of social interactions. Most of these dimensions have been absent from previous medical research which is generally based on existing statistical data […]. (Söderström et al., 2016, p. 109).

Because of the lack of attention to the experiential dimension of 'urban stress' (for an exception in psychiatry, see Ellet et al. 2008; and in geography, see Söderström et al. 2016), 'urban stress' remains a diffuse category. Identifying which urban situations are the most stressful – and why – is of crucial importance (Abbott 2012, p. 164). Working towards answering those questions, researchers need to integrate aspects of mobility, materiality and daily activity in order to "contextualize context", as Kesten (2017) and his colleagues put it. What's more, these aspects must be investigated from the patients' perspective, along with the ways in which they interact with their environments (Lysaker & Lysaker, 2008). Exploring the ways people encounter the urban environment means to take onboard an emic perspective of "urban living" or "urban

[12] I discuss the limits of such understanding of the 'social' more specifically in the second peer reviewed article: see section 3.2.7.

stress”, which is based on the person’s experiences of what it is and what it feels like to live in cities or specific urban situations. Here the use of a geographical approach, more attuned to the relational dimensions of health and place, is fruitful.

2.3.7. Conclusion

Although known to scholars for decades, the link between urban living and severe mental disorders, especially schizophrenia and others psychoses, went through a kind of ‘hibernation’ during the second part of the twentieth century, re-emerging only around the 2000s. Granted, some attention was paid to these questions during that time, but the focus in mainstream research in psychiatry was dedicated to other – mostly biological – determinants of health. However, social scientists, especially in the fields of sociology and geography, continued to delve into the social determinants of health. Nevertheless, the importance and the contribution of the social sciences to a better understanding of (mental) health and illness, was not yet established (Bachrach et al. 2004) during that period and is still often underestimated today (Topp et al. 2018). The social sciences played an important role in the re-acknowledgement of the importance of environmental and social determinants of mental health and, since the early 2000s, a growing number of studies, stemming mostly from psychiatry, established urban living as a risk factor for psychosis. While the association between urban living and psychosis is established for the global north, the mechanisms that explain the association remain unknown. Here the methodological and conceptual boundaries of epidemiology have been identified as limitations. It has been suggested that, in order to work towards the identification of such mechanisms, we need to develop new modes of investigation, nourished by both methodological and conceptual innovations. In the following chapters I examine insights from health geography that provide the theoretical underpinnings for a relational approach to the entanglement of psychosis and urban environment. Furthermore, stress remains a plausible mechanism relating urbanicity to mental health and it has also been identified recently as a field in which social scientists and biologists should engage in a common effort, through a biosocial approach (Rose 2020). I discuss the methodological implications and positioning of my own approach with respect to this call in the second peer-reviewed paper (chap. 3.2).

2.4. Theoretical background: from urban exposure to urban experience

This chapter provides the theoretical background for the conceptual approach of my research. Most of the work discussed above is characterised by a ‘conventional’ conception of space and place in order to isolate the independent contribution of place-level and/or individual-level factors, which results in an underestimation of place effects (Cummins et al., 2007). Although geographers have undertaken some work on those place effects, most of it stems from research ‘outside’ geography and has not been informed by a specifically geographical perspective (Macintyre et al., 2002). Therefore, there is “very little work that has forged an explicitly geographical voice to inform and conceptualise hypotheses concerning “place effects” on health” (Macintyre et al., 2002, p. 126). To understand the utility of health geography and to situate the conceptual approach that underpins my research, a brief overview of the history of modern health geography is warranted. I focus the discussion on two key moments. First, I

discuss the humanistic or 'place sensitive' turn (Crooks et al., 2018) that took place in the 1990s (section 2.4.1), and the posthuman turn that followed during the early 21st century (section 2.4.2).

2.4.1. From medical to health geography

The emergence of "health geography" as a subdiscipline is located in the 1990s and often associated with the seminal paper by Robin Kearns entitled "Place and health: towards a reformed medical geography" (1993), which introduced a distinction between *medical geography* that prevailed, and a new *health geography* that had yet to be developed. In this agenda-setting paper, Kearns suggests "that two interrelated streams be identified in the medicine/health/geography nexus: *medical geography* and *geography of health"* (1993, p. 145). While *Medical geography* focused on spatial and ecological aspects of health and health care, the geography of health – in Kearns suggestion – sought to develop a focus on the dynamic relationship between health and place. This dualism between *medical* and *health* geography has been critically discussed and limitations of such an approach have been highlighted (see Dorn et al., 2010). I do not want to reify the somewhat artificial and counterproductive distinction here. However, this sub-disciplinary divide is useful to understand important changes in the way the relationship between health and place has been conceptualized, as well as more recent conceptual developments (which I discuss the next section). I focus the discussion on the shift from *space* to *place* as a framework for understanding the relation between health and environment. This is identified as the first characteristic of health geography by Kearns and Moon (2002) and is of prime importance for my research. The two remaining characteristics, which I do not address specifically here, are an increased use of social theory to make sense of this relationship and a tendency towards a critical analysis of health disparities and the forces that cause them (see Kearns & Moon, 2002).

Medical geography was mainly underpinned by a positivist epistemology, where space and place are approached as location and research characterised by quantitative methodologies tailored to spatial patterning and locational analysis (Brown et al., 2010a). Accordingly, place is merely the "space on which human activities occur" (Grover & Singh, 2020, p. 10). In viewing space as a 'container' where social relations are carried out, space is considered independent from the social phenomena that it contains (Curtis & Rees Jones, 1998), and "the influence of human behavior and role of space in shaping health is ignored" (Grover & Singh, 2020, p. 10). In contrast, the post-medical health geography advocated by Kearns and others (see for example Jones & Moon, 1993) incorporates cultural and humanistic approaches from broader human geography (Brown et al., 2017; Brown et al., 2010a; Kearns & Moon, 2002; Kearns, 1993). This induces a shift away from the understandings of *space* discussed above and puts emphasis on the constructed and experienced aspects of *place* (Kearns & Collins, 2010). In this respect, health geography complexifies and foregrounds the concept of place, understood as an "operational and living construct which 'matters' as opposed to being a passive 'container', in which things are simply recorded" (Kearns & Moon, 2002, p. 587).

Under the influence of cultural and humanistic approaches, the experience of places, health and disease, as well as the meaning ascribed to them, became central (Brown et al., 2017; Sothern & Reid, 2018). Hence, health and place became apprehended in a dynamic and reciprocal

relationship (Grover & Singh, 2020; Kearns, 1993; Rosenberg & Wilson, 2005). Such approaches aim to “understand personal experiences and feeling and how people attach meaning to their surrounding” (Gesler & Kearns, 2002, cited in Brown et al., 2017, p. 44), as well as how these experiences contribute to health and how individual experiences of ill-health shape the meaning ascribed to places (Rosenberg & Wilson, 2005, p. 23). This called for a commitment to qualitative approaches, deployed in various ways; from interviews and ethnography, to literature and art (Sothern & Reid, 2018, p. 96). In sum, this post-medical health geography goes beyond spatial and locational perspectives on health and place, by recognizing the dynamic and reciprocal relationship between the two:

> The importance of the turn to “health” was its recognition that medical geography, as then conceived, tended to employ geometric constructions of space that limited our understanding both of the ways in which ill-health and disease (and for that matter good health) were experienced and lived and what role “place” played in this regard. (Brown et al., 2010b, p. 3)

Humanism was a response to the perceived limits of the dominant quantitative spatial analysis, devoted to the description of the distribution of health outcomes, and underpinned by a geometric and locational understanding of space (Sothern & Reid, 2018, p. 97). To this detached perspective and the “placelessness” of medical geography (Sothern & Reid, 2018, p. 97), a humanistic approach asked how the world and place are experienced, emphasised the complexity of such experiences and veered towards a “deep qualitative commitment to understand the lifeworlds and meanings participants themselves attached to places institutions, their own bodies and experiences of health and health care” (Sothern & Reid, 2018, p. 96). From the early 2000s, further theoretical and epistemological developments in the field provided new perspectives and opportunities for research (Andrews et al., 2018). These are discussed in the following section.

2.4.2. From health geography to posthuman health geographies

Humanistic qualitative health research placed human subjects at the centre of attention, exploring how human subjects understand, experience and create their own world (Sothern & Reid, 2018). These approaches treat conscious reasoning as the main attribute of human condition (Andrews & Duff, 2019a), and language and discourse are considered to be the basis of social phenomena (Andrews & Duff, 2019b). Since the 2000s, scholars anchored in various theoretical orientations have started to challenge certain aspects of these anthropocentric (human-centred) understandings; in essence, the posthuman turn “has decentred and deprivileged ‘the human’, looking to the nonhuman and ‘more-than-human’” (Andrews & Duff, 2019b, p. 46). Variations of this critique have been made by many theoretical orientations (new materialism, relational thinking, assemblage theory, actor network theory, vitalist theory, non-representational theory, affect theory, feminism, post-phenomenology, biosocial theory) that engage with more-than-human aspects of health and their social and material antecedents (Andrews & Duff, 2019a). Nevertheless, posthumanism “can be said to offer a coherent orientation to questions of method, ontology or epistemology” (Andrews & Duff, 2019a, p. 124), providing the basis for a new research paradigm.

Posthumanism stems from observations of the wider "posthuman social condition" we increasingly live in. Scholars having argued that "the idea of the 'human subject' no longer accurately reflects the conditions of lived experience, or the experience of social relations, there being a more horizontal and co-equal, rather than top down hierarchical, relationship between the human and nonhuman" (Andrews & Duff, 2019a, p. 47, references omitted). Hence, there is no rupture between humanism and posthumanism, but rather continuity (Sothern & Reid, 2018); an attentiveness to people and their health experiences still underpins academic research in the field, but posthumanism proposes a reconceptualisation of the human being as only and always a *part of* and/or *an outcome* of larger, distributed forces:

> Posthumanism asserts that all things should be understood as products of distributed, expansive processes involving associations and encounters between multiple living/biological and material/technological actors, as well as the excessive vital forces that exist within these actors and that emerge within their associations and encounters. (Andrews & Duff, 2019a, p. 124, references omitted).

As a consequence, posthumanism extends earlier humanistic concerns in health research in other-than-fully conscious and more-than-human terms, yet the human referent remains essential (Andrews & Duff, 2019a). It is not the aim of the present chapter to discuss the epistemological and ontological origins and implications of the posthuman turn extensively, but rather to outline the novel understandings of health that have become distinctive features of such research and that are of relevance to the present study. In three recent articles, Gavin Andrews and Cameron Duff (Andrews, 2019; Andrews & Duff, 2019a; 2019b) identify three new major understandings of health as well as health and place relationships that "act as a loose framework for health geography, with scholars accepting them as principles which enable them to ask certain questions" (Andrews, 2019, p. 1112): (i) health emerging through relational assemblages, (ii) health enabled by performing open vital bodies and (iii) health in the immediate, pre-personal and more-than-representational. Through this framework "health is (re)conceived not as a physiological or psychological condition, but instead as a mode of existence. At issue are the struggles and journeys humans undergo, and the actors they encounter, in becoming and feeling more or less healthy" (Andrews, 2019, p. 1112-1113). In the following, I discuss these three aspects, as they provide a broad theoretical background for the conceptual approach used in the present study (discussed in chapter 2.5).

Health emerging through relational assemblages

Decentring the human subject in the way health and/or illness emerge, posthuman health geographers emphasise the relational dimensions involved in health and, in so doing, have increasingly drawn from assemblage theory (Andrews 2019). According to this way of thinking, human and non-human bodies and materialities are responsible for the emergences of health and/or illness (Andrews, 2019):

> Rather than treat health and illness as characteristics of specific human bodies or populations, recent work has sought to position health and illness as dynamic, emergent expressions of specific socio-material assemblages (Andrews & Duff, 2019a, p. 125).

This approach draws attention to the (i) composition and (ii) processes of such assemblages (Andrews, 2019). An assemblage is a heterogeneous *composition* of human and non-human

entities that may contribute to health and/or illness. Since the individual components of an assemblage are rarely healthy or unhealthy *per se*, but rather "contributors to the becoming or retraction of health" (Andrews, 2019, p. 1113), an assemblage's *processes* reveal "the many mechanisms – such as affects, relations and events – involved in the becoming or retraction of health in particular places" (Andrews, 2019, p. 1113, references omitted). In sum, assemblage thinking leads to questions such as "What is in-situ? What is arriving or leaving? What is passive or active? What is interacting with what and how?" (Andrews, 2019, p. 1113). According to this approach, it is usually the assemblage rather than any isolated component or mechanism that should be the focus of analysis, even if in analytical terms these actors and forces may be distinguished (Andrews & Duff, 2019a).

Health enabled by performing open vital bodies

When health is conceived as a modulation/expression of assemblages, the human body is removed from its privileged or isolated position, and posthuman health geography "turns towards the wider origins and character of the emergence of bodily health (as opposed to changes in the body itself or opinions on the body)" (Andrews, 2019, p. 1114). This does not mean that the human body disappears in a posthuman approach to health. Rather, through an engagement with vitalist philosophies, posthuman health geography theorises the body as open to, and influenced by, its relations to other humans and non-humans (Andrews et al., 2014):

> [F]or posthumanist researchers influenced by certain strands of vitalism, the body is characterised by its spatially and temporally variable capacities to affect and be affected by the entities it encounters […]. (Andrews & Duff, 2019a, p. 126).

As such, posthuman approaches to health reject the separation of the 'biological' and the 'medical' from the 'social', the three being deeply entangled. This resonates with biosocial thinking, where biological life is understood to be permeable to social influences, as the social 'gets under the skin'[13]. This permeability, the 'plasticity' as it is sometimes called in biosocial approaches – understood as the "adaptation and modifications of the body mediated by environmental stimuli, social conditions and life experiences" (Chiapperino & Panese, 2021, p. 4) – recognises "the many vital connections that exist between the body as an open entity and the material, performed social world" (Andrews & Duff, 2019a, p. 53). Thus, Physiological/bodily expressions such as blood pressure, respiration rates or skin conductance "are always relational achievements of the events in which they occur" (Andrews & Duff, 2019b, p. 126). Affect, drawing attention to the body's relational capabilities, its potential to interact with other bodies (both human and non-human), becomes central in this new understanding of health (Andrews & Duff, 2019a; 2019b). In the context of the *affective turn* that took place in social science at the end of the 1990s, affect was, and still is, the subject of much debate and controversy. A bottom line agreement on affect in academia is summarised by Andrews and Duff:

> A general academic consensus is that affect is an infectious *trans*-individual process, in that it involves bodies affecting other bodies (often aided by material actors), this resulting in increases or decreases in their individual and collective energy. Moreover, that affect is

[13] Biosocial research and thinking – and its relevance to the present research – is discussed more thoroughly in the methodological section, since it provides strong underpinnings for the method used in this study.

> experiential; it being felt as the intensity of one's material/human environment and the intensity of one's involvement in it (Andrews et al., 2013; Andrews & Grenier, 2015, 2018). Somatically registered then as a vague yet powerful 'feeling state', affect is not thought to be a typical emotional category and experience (such as fear, love, loss, anger, empathy and numerous others). (2019b, p. 43)

Thus, affect, and the sense of place it 'captures', is less about fully-formed and expressed emotions, and more about a visceral sensing of the energy and atmosphere of place (Andrews, 2019). Affective mechanisms, experiences and atmospheres – and their potential to encourage health – have been explored in mental health service use (Kanyeredzi et al., 2019) and in mental health recovery outside institutional contexts (Duff, 2016). Further discussion on affect and affective atmospheres and their implications for the present study is held in the conceptual discussion (chapter 2.5).

Health in the immediate, pre-personal and more-than-representational

As became apparent in the discussion of affect, a third broad implication of a posthumanistic approach is the conception of health "in terms of particular immediate, pre-personal and more-than-representational modes and processes". Drawing on the philosophy of Gilles Deleuze, posthuman geographers, rather than attributing health to structural impositions or transcendental phenomenon (Andrews et al., 2014), maintain that health arrives within a 'plane of immanence':

> This approach involves attention to the base immediacy/happening of life, recognising that health is always expressed on a 'plane of immanence'; a self-organising process that manifests and reveals the world. Scholars note that the plane is impersonal, pre-personal, subjectless, neutral, indefinite and unconfined; preceding meaning or individualization it existing only through the singularity of events (Andrews & Duff, 2019a, p. 126).

In this conception of health, "[t]he key objective […] is to track the relations and events by which health and illness are lived as qualitative features of life (see also Fox, 2002)" (Andrews & Duff, 2019a, p. 126). To this end, scholars lean heavily on more-than-representational theory. This line of thinking and researching focuses on the "'bare bones' practices, textures and pushes of life, animating what is happening in the creation of health, often evoking forms of movement, awareness, knowledge and affective inter-body solidarity that do not involve full contemplation or verbalization" (Andrews, 2019, p. 1114). Andrews identifies a few major areas of interest of such approach[14]. Among others, we find (i) the 'onflow' of space and time, for example bodily and material movement in everyday random moments of wellbeing, (ii) '[f]oregrounds and backgrounds' and their subtle powers, as for example, therapeutic landscape art in hospital waiting rooms and ambient background noise in therapeutic retreats, (iii) ordinary and everyday life and space, (iv) '[a]ffective mechanisms and experiences', i.e. atmospheres and environments which encourage, or not, health, as for example, in mental health service use and recovery. Interest in these domains has led and continues to lead to innovations in data collection and research methods "as scholars across the social sciences have sought to

[14] For a more thorough discussion on the utility of non-representational or more-than-representational theory for health geography see Andrews 2014; 2018; 2019b.

experiment with modes of research practice that may provide access to different registers of sensory experience, affective life and atmospheres" (Andrews & Duff, 2019a, p. 127).

2.4.3. Conclusion

In sum, building on the qualitative turn that forged health geography as a distinctive approach with regard to medical geography, posthumanism captures a variety of different but intertwined theoretical orientations that allow health geographers to reframe and rethink human environment relations with regard to health (Andrews, 2019). The three dimensions of a posthuman understanding of the health and place relationship foreground "the complexity and deep mutual permeability of relations between fleshy embodied people, and the continually changing materiality of place" (Sothern & Reid, 2018, p. 96). Such an approach is anchored in a first-person perspective, that can produce distinctive and more nuanced understandings of the relationship between urban environments and psychosis:

> Such experience-based approaches are capable of grasping bodily, sensory, emotional and spatial dimensions of urban life and therefore have distinct advantages in studying urban psychosis nexus. […]. Compared with quantitative methods or standard interviews, these approaches provide distinctive information in that they are able to provide insight into urban living as an embodied and mobile experience of space and place, beyond verbal representation. (Li et al., 2019, p.21)

A few studies, have started to pave the way (without necessarily explicitly referring to posthumanism) by adopting ethnographic methods (Li et al., 2019; Söderström et al. 2016 and 2017, Codeluppi 2019, Bister et al. 2016, Bieler, 2021a), but a posthuman theoretical stance goes one step further. In response to the decontextualised accounts of 'urbanicity' in psychiatry, there have been calls within the social sciences to develop research that is "much more ontologically ambitious than the epidemiological demonstration of the 'social determinants' of health" (Fitzgerald et al., 2016 p. 151) and for research that collaborates with, or takes onboard, the life sciences and biology:

> We suggest that we need to improve the ways in which sociological analysis and biological analysis might work together through the identification of mechanisms, imagined and confirmed through data, of the way in which urban life gets 'under the skin' (Li et al., 2019, p. 21)

It has been argued that "the study of social pathways could capitalize on conceptual and methodological advances to help investigators determine whether and how certain places act as reservoirs of risk for—or protection from—psychosis" (March et al. 2008, p. 97). The next chapter explores such conceptual perspectives, by means of the first peer-reviewed article. The proposal lays the conceptual foundations of my dissertation by discussing the notions of '*ambiance urbaine'* and *affective atmospheres* as stressing two different modes of experience; the former anchored in the perceptual, sensory and conscious level of urban experience, and the latter referring to a more pre-reflective and pre-discursive bodily dimension. In a following step, throughout the methodological chapter, I will suggest bio-sensory ethnography – understood as a combination of physiological data and ethnographic data – as a means to study how the environment 'gets to the skin' and "how what is *emplaced* ultimately becomes *embodied"* (March et al. 2008, p. 97, emphasis added).

2.5. Article I: An atmospheric approach to the city/psychosis nexus

Marc Winz

2.5.1. Foreword

The full title of the paper is "An atmospheric approach to the city/psychosis nexus. Perspectives for researching embodied urban experiences of people diagnosed with schizophrenia". This article was published in *Ambiances* in June 2018. *Ambiances* is a French open access online journal, dedicated to the sensory environment, architecture and urban space. With an international outlook, it publishes peer-reviewed contributions in French and English[15].

2.5.2. Summary

The aim of this paper is to ground an analysis of the city/psychosis nexus, and more precisely of the urban experience of individuals diagnosed with schizophrenia in a theoretical framework built on the notion of affective atmosphere, as conceptualized in recent Anglo-American human geography and on the notion of ambiance, as conceptualized in research on architecture and urban studies in France. Drawing upon the confrontation of those concepts, the paper highlights the similarities of ambiance and affective atmospheres, before underlining their differences. It is argued that an atmospheric approach points out dimensions not sufficiently taken into account in research in psychopathology. Furthermore, the two concepts stress two different registers of experience: whereas ambiance puts emphasis on a perceptual, sensory and conscious level of experience of urban environment, affective atmosphere highlights a more pre-reflective, bodily dimension. Finally, the paper sketches out a methodological framework in coherence with this conceptual distinction.

Keywords: ambiance, affective atmosphere, schizophrenia, urbanicity, stress, biosensing

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2.5.3. Introduction

The relationship between cities and psychosis, notably reported in 1939 by Robert Faris and Warren Dunham, has gained renewed interest in recent years, and urbanicity — as labelled within psychiatry — has been found to be associated with increased risk for schizophrenia and psychosis (Vassos et al., 2012, p. 1118). However, the mechanisms linking urban milieus and mental illness are still unknown. In medical research, most studies addressing the relation between urbanicity and psychosis or schizophrenia have dealt with the city as substance, "as set of material things and social characteristics" (Söderström et al., 2016, p. 109) to which one would be *exposed*, rather than the city as experience. In order to gain insight in the

[15] Winz, M. (2018). An atmospheric approach to the city/psychosis nexus. Perspectives for researching embodied urban experiences of people diagnosed with schizophrenia. *Ambiances. Environnement sensible, architecture et espace urbain*. https://doi.org/10.4000/ambiances.1163

ways in which urbanicity and psychosis are entangled, Söderström et al. argue that this static perspective is not sufficient; there is a need to shift to a more fluid one, where the "city is approached as a flow of experience, in which patients encounter elements that are assembled in various ways depending on how they see and practice 'the urban'" (p. 109).

The aim of this paper is to ground such an analysis in a theoretical framework built on the notions of affective atmosphere, as conceptualized in recent Anglo-Saxon human geography and on the notion of ambiance, as conceptualized in research on architecture and urban studies in France. These two literatures have coexisted until pretty recently, with only very little confrontation. Besides, the two concepts are often used interchangeably, as synonyms, both within their respective linguistic contexts, as well as across linguistic frontiers. Although those concepts are very close theoretically (Adey et al., 2013; Thibaud, 2015; Jones & Jam, 2016), slight variations between them can be identified. In doing so, we keep in mind, as Jones & Jam note, not "to draw artificial distinction between the concepts of atmospheres and ambiances" (2016, p. 318).

The article is structured as follows. Drawing upon the confrontation of those concepts, the paper first highlights the similarities of ambiance and affective atmospheres, before underlining their differences. It is argued that ambiance and affective atmosphere share a common spatial perspective, while stressing two different registers of experience: whereas ambiance puts emphasis on a perceptual, sensory and conscious level of experience of urban environment, affective atmosphere stresses a more pre-reflective, bodily dimension. Following that, the paper discusses the heuristic value of this shared spatial perspective for investigating the city/psychosis nexus; providing particularly fertile conceptual ground from which to capture urban experience as lived by people diagnosed with schizophrenia, this atmospheric approach points dimensions not sufficiently taken into account in research in psychopathology. Finally, in the last section, the paper sketches out a methodological framework in coherence with these conceptual considerations.

2.5.4. Ambiance and affective atmospheres, a common shared spatial perspective

This section first briefly sheds light on the definition of both ambiance and affective atmosphere, in order to subsequently depict five main similarities between the concepts identified in this paper. Firstly, ambiance and affective atmospheres convene a multisensorial register of perception. Secondly, they emerge in the coalescence of object and subject. Thirdly, they are never static, but instead evolving constantly. Furthermore, affective atmosphere and ambiance are situated, and hence multiple within a city. Finally, they comprise a performative dimension. As a foreword, we may say that both concepts largely integrate their respective common sense meaning and a part of the "intuitively obvious", on top of which layers of interpretation and theorization have been accumulated (Jones & Jam, 2016, p. 318).

Ambiance has a long tradition in French research. Its origins lay in the work of philosopher and urban socio-anthropologist Jean-François Augoyard and stems from work on urban walking and the sensory dimensions associated with it: sound and sound effect within cities were of central

interest in Augoyard's work (Augoyard and Torgue, 1995). Until today, ambiance is still particularly associated with the literature produced by scholars of the *Centre de Recherche sur l'Espace Sonore et l'environnement urbain* (CRESSON), founded by Augoyard in 1979 and based in the school of architecture in Grenoble (École nationale supérieure d'architecture de Grenoble). Embedded within a school of architecture, the notion was then primarily used to describe objectively measurable features of architectural environment, such as acoustic, thermics and lighting for example. Over time, the notion became more complex and interdisciplinary, including not only the configuration created through the manipulation of those features, but also the way those situations were experienced, hence "articulating built forms, sensible forms and social forms" (Thibaud, 2015, p. 40). Jean-Paul Thibaud, one of the leading scholars working on and theorizing ambiances, defines the notion as follows:

> To put it in a nutshell, an ambiance can be provisionally defined as a space-time qualified from a sensory perspective. It appears as an alternative to bridge the sensitive, the spatial and the social domains. (Thibaud, 2011a, p. 203)

The provisional trait given to this definition by Thibaud is recurrent in the literature on ambiance. Scholars working on ambiance often refuse to define the concept, Amphoux speaking rather of an "indefinition" than a definition of ambiance (2003, p. 53). Generally speaking, ambiance involves the built and material dimension of inhabited space, as well as the sensory and subjective experience – the lived experience (Thibaud, 2011b, p. 43) – of architecture and urban design. The manipulation or the staging of an ambiance, which refers to the "active interventions with the intention of re-engineering the feeling of urban spaces" (Jones & Jam, 2016, p. 317) is very present in the French theorization of the notion, and central in the origins of the notion of ambiance within architecture[16].

Whereas research on ambiance is strongly based on practice, as well as oriented towards practical research outputs, literature on affective atmospheres is more theoretically driven (Jones & Jam, 2016, p. 318). As a matter of fact, the origins of the concept of *atmosphere*, on which that of *affective atmosphere* is elaborated, lie in the work of the German philosopher Gernot Böhme. In an article published in 1993, Böhme proposes the concept of atmosphere to be at the foundation of a new aesthetics, understood as theory or philosophy of perception. Therefore, Böhme's understanding of atmospheres is resolutely phenomenological: "on entering a room one can feel oneself enveloped by a friendly atmosphere or caught up by a tense atmosphere" (1993, p. 113). His account of atmospheres laid the foundations of an ever since growing field of research, both in the Anglo-American context – discussed in the present paper – and in the German-speaking context. Within German human geography, Böhme's phenomenological interpretation of atmospheres has notably been taken up by Jürgen Hasse (2012), who has been a key researcher in bringing the discipline – and especially urban studies – towards the investigation of atmospheres. Although it could be of interest to consider this third

[16] For a more thorough review on ambiance in English, see Thibaud 2011a and 2011b.

major trend in the field, it is beyond the scope of this paper to do so.

Within recent Anglo-American human geography, Ben Anderson draws on Böhme and conceptualizes atmospheres alongside affect in a seminal paper entitled *Affective Atmosphere,* as "a kind of indeterminate affective 'excess' through which intensive space-times can be created" (Anderson, 2009, p. 80).

> Affective atmospheres are a class of experience that occur *before* and *alongside* the formation of subjectivity, *across* human and non-human materialities, and in-*between* subject/object distinctions (after Seigworth, 2003, see Anderson and Wylie, 2009). As such, atmospheres are the shared ground from which subjective states and their attendant feelings and emotions emerge. (Anderson, 2009, p. 78, emphasis in original text)

The few scholars confronting the two notions (Adey et al., 2013; Thibaud, 2015; Jones & Jam, 2016) agree on the fact that those two different research traditions meet "on the basis of the same area of questioning" (Thibaud, 2015, p. 40), in "an adjustment of thinking towards and around the relations between bodies and their environments" (Adey et al., 2013, p. 301). To put it simply, scholars "working on both atmospheres and ambiances are concerned, among other things, with how places feel" (Jones & Jam, 2016, p. 317). It is generally considered that both affective atmospheres as well as ambiances do not exist as substances. They require a perceiving subject. Sensory perception and experience are therefore crucial to both research traditions (Bille et al., 2015, p. 32). If in early works sound and sound effects were of particular interest to researchers on ambiance, other senses have been given more attention since. Nowadays, the concept of ambiance is one that stresses the multisensorial dimension of perception: "[…] any ambiance involves all the senses at once (hearing, seeing, smelling, touching, tasting, moving...) and relies on a multisensorial experience" (Thibaud, 2011a, p. 204). While this aspect is explicitly and extensively addressed in the literature on ambiance, it is less discussed in literature on affective atmosphere, where it is rather taken for granted. Nevertheless, ambiances and affective atmosphere do not solely depend on sensory perception; they are considered to emerge neither entirely from the social and physical environments one encounters, nor entirely from one's personal or collective subjective experience. Scholars on both ambiance (Amphoux, 2003; Thomas & Thibaud, 2004; Chadoin, 2010; Thibaud, 2011a; 2011b; 2012; 2013; 2015; Kazig & Masson, 2015) and atmosphere, respectively affective atmospheres (Böhme, 1993; Anderson, 2009; Adey et al., 2013; Buser, 2014; Duff, 2015; Bille et al., 2015) argue that these notions question the binary distinction of object and subject. Affective atmospheres as well as ambiances are considered to be "in the middle" (Buser, 2014), being "neither fully subjective nor fully objective but circulate in an interstitial place in and between the two" (Adey et al., 2013, p. 301).

This relational nature of affective atmospheres and ambiances leads to two other common attributes. First, emerging in the coalescence of bodies (both material and human), affective atmosphere and ambiance are never fixed, but "constantly in a state of becoming" (Buser, 2014), and therefore subject to change. Second, emerging partially from environmental bodies in presence, affective atmospheres and ambiances are situated and plural: city

dwellers experience several different atmospheres and ambiances when moving around the city. Finally, scholars on both affective atmospheres (Anderson 2009; Bissell, 2010) and ambiance (Thibaud, 2016) acknowledge their performative nature. Accordingly, they are considered as potentially inhibiting or disinhibiting actions and/or emotions:

> Possibly the most effective way of grasping the idea of an affective atmosphere is therefore to think of it as a propensity: a pull or a charge that might emerge in a particular space which might (or might not) generate particular events and actions, feelings and emotions. (Bissel, 2010, p. 273)

> *What does an ambiance do*? One wonders here what the ambiance makes it possible to perceive, to do, to live, to share. In terms of experience, ambiance has the capacity to suggest movements, incite behaviors, induce affects, activate the memory of the body, reinforce sociabilities. (Thibaud, 2016, p. 694, emphasis in original text)[17]

The common ground of these concepts discussed so far, the "clear overlaps between ideas around ambiances and atmosphere" (Jones & Jam, 2016, p. 318), provide a shared – atmospheric – spatial perspective summarized by Buser as follows:

> From this spatial perspective, we can imagine how in daily experience, one might experience any number of affective atmospheres – coalescing and collapsing, erupting and dissipating along with shifting relationships and movements between bodies and objects. (Buser, 2014, p. 234)

Buser writes on affective atmospheres, but as shown, his statement is accurate for ambiance as well. This spatial perspective is crucial if we seek to capture the urban experience as suggested by Söderström et al. (2016) in the introduction of this paper. Despite this common perspective, slight variations between the two concepts can be identified, which render problematic the transition from one to another, argue Kazig and Masson (2015, p. 217). The following section discusses those nuances and suggests taking advantage of them for an empirical investigation of how people diagnosed with schizophrenia experience cities, instead of considering them problematic.

2.5.5. Different registers of experience

According to Thibaud, ambiance and atmosphere highlight different aspects of the subject-object relationship (Thibaud, 2015, p. 40). In this section, the article suggests to further investigate those different aspects. It will be argued that ambiance and affective atmosphere allow capturing two different registers of experience; while ambiance stresses a sensory and consciously mediated experience, affective atmosphere points to an embodied, pre-reflective register.

Affect and emotions gained new interest in social sciences with the "affective turn", which came with a wide range of interpretations of the notions of affect and emotion, as well as of the way these two are linked. Affect and emotion are sometimes used as synonyms, although definitions of each of these categories are widely

[17] Personal translation of the original text: *Que fait l'ambiance? On se demande ici ce que l'ambiance permet de percevoir, de faire, de vivre, de de partager. Au niveau de l'expérience, l'ambiance a la capacité de suggérer des mouvements, inciter des comportements, induire des affects, activer la mémoire du corps, renforcer des sociabilités* .

discussed, and vary across disciplines and theories. In *The Affect Theory Reader,* published in 2010, Melissa Gregg and Gregory J. Seigworth compile contributions from different authors, in order to tentatively lay out no less than eight different orientations in the theorization of affect (2010, p. 6). Within recent human geography, the discussion on affective atmosphere is enshrined in a debate differentiating affect from feeling or sensation, as well as from emotion. In order to establish this distinction, cultural geographer Ben Anderson draws on Massumi who's understanding of affect comprises three core ideas, summarized by Wetherell (2012, p. 61) as follows: (i) affect is non-conscious, and (ii) it moves in a chronological sequence from body response to consciousness and cognition; thus, affect could be neatly separated from body/brain responses. Finally, (iii) Massumi considers body/brain responses to be autonomous, and beyond representation[18].

While Massumi separates the body from mind, Ben Anderson "tries to stitch [them] back together" (Wetherell, 2012, p. 66) in suggesting a three-layer cake model of the relationship between affect, feeling and emotion. On the first, deepest layer, is affect itself, in Massumi's understanding; affect is inscribed in the non-cognitive, unconscious, corporeal/bodily and immediate register. It is both beyond pre-cognition and cognition. In this conception, affect is considered to be diffuse: "affect refers to flows (of affect) between bodies" (Pile, 2010, p. 9, referring to Anderson). The second layer is considered to be pre-reflective, pre-cognitive; feelings or sensations remain tacit and intuitive and are not yet expressed or named. Finally, the last level is that of cognition, where we find emotions: "emotions are expressed feelings, being both conscious and expressed" (Pile 2010, p. 9). They refer to a reflexive moment, to the actual awareness and verbalization of the sensation (Massumi, in Labyiani, 2010) or to "the socio-cultural expression of [a] felt intensity" according to McCormack (2008, p. 414).

Hence, in this conception it is considered that the differences between affect, feelings and emotion lie at the level of consciousness at which they occur: "[a]ffect, sensation and emotion thus occupy different points on a continuum going from body to mind, each having a different temporality" (Labanyi, 2010, p. 224)[19]. As such, affect always lies outside of representation: either it is outside of consciousness and therefore not able to be put in linguistic representation, or it is no more *affect*, but has become *emotion*. Obviously, "this creates a bit of an epistemological impasse for empirical investigation" (Ellis et al., 2013, p. 725). However, Derek P. McCormack argues that the concept of affective atmosphere can be understood in its affective sense as "something distributed yet palpable, a quality of environmental immersion that registers in and through sensing bodies while also remaining diffuse, in the air, ethereal" (2008, p. 413). The idea of a *registration* of affect in bodies is also present in Massumi's understanding, as he qualifies affect as *intensities,* which can be registered in the physiology of human bodies, and measured through heart rate fluctuation or respiratory system activity (2002). Wetherell argues that Anderson "seems to include autonomic

[18] For a critical lecture of this conception of affect, see Wetherell (2012), chapters 1 – 3.

[19] For a critical lecture of such duality between affect/emotion and between body/mind, see Leys (2011) and (2017)

bodily responses registering that something affecting has happened such as the heat of a blush, the tension of an angry body, and so on" (2012, p. 66) at the second level of his layer cake model. Besides, Brennan, who is interested in how affect circulate, considers the transmission of affect as being of atmospheric nature, with social or psychological origins, and physiological or biological implications:

> In other words, the transmission of affect, if only for an instant, alters the biochemistry and neurology of the subject. The 'atmosphere' or the environment literally gets into the individual. (Brennan, 2004, p. 1)

If affect is ineffable and outside of representation, its registration in sensing bodies seems to be graspable. Ellis, Tucker and Harper call this *registration of affective activity* a "third realm" (2013, p. 725), between that of unconsciousness and that of discursive representation. Because of the theorization of atmospheres alongside with affect in recent human geography, affective atmospheres are concerned with the deeper layer of experience, from which feelings and emotions emerge. Affective atmospheres take into consideration the unconscious and pre-reflective part of experience. In this conception, the body, or rather the register of affective bodily experience (not yet mediated through consciousness), comes to the foreground. In contrast, this level of experience is rather absent in the concept of ambiance. This is not to say that literature on ambiance totally evacuates pre-subjectivity. In the more recent literature and research, Thibaud introduces the notion of affective tonalities (*tonalités affectives*) as a constitutive part of an ambiance, in order to grasp and include a subconscious layer of experience:

> The moment of the constitutive sensing of aesthetic experience refers rather to ways of experiencing the world, relates to affective tones and ways of being together in an environment. With such an aesthetics of ambiance, we have to deal with the pre-reflective dimension of the experience, the one that goes first and foremost through a bodily experience and an immediate sensation. (Thibaud, 2013, p. 8)[20]

Affective tonalities are considered by Thibaud to be pre-reflexive in a phenomenological perspective. In other words, they can be considered as conscious, but not reflected upon. As such, affective tonalities might refer to the feelings and sensation described above, and less to the level of affect. Besides, this aspect remains rather marginal in the literature on ambiance, whereas it is much more central in the conceptualization of the notion of affective atmosphere. Moreover, affective tonalities are not very well defined; as a result, it is sometimes used to refer to the valence of the feeling one might associate with an ambiance. Hence, within French research, ambiance is much more focused on perception (Adey et al., 2013, p. 302) and "tends to emphasize more the situated, the built and the social dimensions of sensory experience" (Thibaud, 2015, p. 40).

In summary, it has been shown that – perhaps due to its background within architecture as note Jones & Jam (2016) – ambiance is much more concerned with the consciously lived

[20] My translation of the original text : *Ce moment du sentir constitutif de l'expérience esthétique renvoie plutôt à des façons d'éprouver le monde, se rapporte à des tonalités affectives et des manières d'être ensemble dans un milieu. Avec une telle esthétique des ambiances, on a affaire à la dimension pré-réflexive de l'expérience, celle qui passe avant tout par un vécu corporel et une sensation immédiate*

experience, paying particular attention to the sensory register and the materiality of the environment. Affective atmospheres, on the other hand, take into consideration the pre-cognitive and the bodily part of that experience. This is not to say that authors writing on affective atmospheres are exclusively interested in that part of experience, evacuating other dimensions, but that they stress this dimension more than the ambiance approach. Together, these two concepts focus the research on both how the urban is lived and experienced through our senses and in relation to social and material environments, and how it literally gets under our skin – on a less conscious level.

2.5.6. Ambiance, affective atmosphere and urban mental health

Why relate the concepts of affective atmosphere and ambiance to the mental health-city nexus? In this section, the article depicts how geographical research on urban mental health can be enriched when approached through this atmospheric lens. I first draw a brief state of the art of the literature on urban mental health, before outlining how ambiance and affective atmosphere have been used within mental health research. This leads, thirdly, to pinpointing three key areas of relevance where ambiance and affective atmosphere provide a particularly distinctive and productive perspective: inter-sensorial perception, transitions between atmospheres or ambiances, a focus on the built environment.

Within psychiatry, the vulnerability-stress model (also called diathesis-stress model), first introduced by Zublin and Spring in 1977 (Zublin & Spring, 1977), unites different approaches to psychosis and provides a useful framework for understanding onset and relapse of psychoses. Widely accepted today, this model posits that the onset of the illness results from the interaction between constitutional factors of vulnerability and external stress factors. Vulnerability marks a threshold of tolerance, which, once exceeded, leads to psychotic decompensation. Among the external stress factors, living in urban areas has been seriously considered as a risk factor since the early 2000s. Therefore, for two decades, a growing number of studies have confirmed the higher prevalence of schizophrenia in the city (Mortensen, 2000; Allardyce et al., 2001; Van Os, 2004). Consequently, the correlation between urbanity and schizophrenia is now verified (Kelly et al., 2010; Krabbendam & Van Os, 2005) and a meta-analysis of recent studies shows a rate of people with schizophrenic disorders 2.37 times higher in the city (Vassos et al., 2012, p. 1118). However, the nature of the link that binds them, as well as the mechanisms involved still remain very unclear (Söderström et al., 2016, p. 104).

"Urban stress" has been advanced as a plausible hypothesis relating psychosis to cities. But this notion of "urban stress" remains however rather diffuse and unclear (Abbott, 2012), "referring to a wide spectrum of potential factors, ranging from exposure to noise and pollution to more complex concepts such as social interaction" (Söderström et al., 2016, p. 105). It is therefore important to clarify this notion, to refine our understanding of how a particular environment can be stressful, and if possible, identify "which parts of a busy city life are the most stressful" (Abbott, 2012, p. 164). In a nutshell, we may say that stress is identified as aversive for psychosis, and so is urbanicity. And life in cities is considered stressful, but at the same time, "urban stress"

remains vague. According to the Vulnerability-stress model, psychotic crises occur in the encounter between predispositions present within the person in question, and life events or environmental influences perceived and experienced as a source of stress. It is important to note that minor stress events – and especially their accumulation – have been identified as crucial in the etiology of psychoses within the vulnerability-stress model:

> Rather than reactions to the extreme exposures that life events often represent, sensitivity to minor life events or daily hassles has been postulated to more closely resemble the underlying vulnerability for psychopathology, especially in schizophrenia. (Myin-Germeys et al. 2003, p. 124)

It is therefore crucial, argue Söderström et al., (2016), to investigate how different factors of stress combine in the experience of cities, and moreover, how they are seen and experienced from an emic point of view. The question now is: where do ambiance and atmosphere, and, more specifically, the nuance between them discussed in this paper, lead us in relation to conceptualizing and investigating the city/psychosis nexus?

Tracing the common history of psychiatry and ambiance as conceptualized by Thibaud, psychiatrists Chaperot and Altobelli (2014) show that ambiances have principally been apprehended through their effects on psychotic (schizophrenic and borderline) patients in institutional milieus. The authors conclude that ambiance "is a fundamental element in the treatment of psychiatric patients, which must be considered with more attention that is generally given to it" (p. 542). Regarding affective atmosphere, medical anthropologist Cameron Duff draws from the geographical literature on affective atmosphere "to prise open the spatial and embodied rhythms of recovery" (2015, p. 2), in order to research the ways socio-spatial factors are entangled in the process of recovery. Therefore, on the one hand, ambiance is considered to be of importance in relation to psychiatry, but has been studied only in institutional and not in urban contexts, and, on the other hand, affective atmosphere has been explored in the everyday experience of recovery of patients, but not in relation to stressful and aversive events, and with no regard to the different levels of experience the two concepts refer to.

In the following, the article pinpoints three key areas where the shared spatial perspective – the atmospheric approach outlined above – provides a particularly productive angle for studying the city/psychosis nexus, with regard to minor stress events and their accumulation. First, these concepts both propose to consider the five senses together in the perception of the environment, and as well as in its analysis, rather than separately. This approach encourages us to focus on the multi- or inter-sensorial perception of the city: in other words, we need to take into account the fact that we see, feel, touch and hear the city at the same time and we need to look at how our five senses work together, simultaneously and/or consecutively (Candau, 2010) in the constitution of urban experience and in the creation of stress feelings. Attention disorders, or more precisely the difficulty in filtering relevant information is often present in people diagnosed with schizophrenia (Nevid et al., 2009, p. 259), and patients may also experience hypervigilance, defined as increased attention to sensory stimuli (Nevid et al., 2009, p. 261). Söderström et al., (2016) have already highlighted the importance of

sensory stimulation and its potential source of discomfort in the experience of urban space by people diagnosed with schizophrenia. Taking into account the inter-sensorial perception of the environment should help to hone our understanding of the sensory overload, known in psychiatry as an excessive number of stimuli surpassing a patient's ability to absorb them (Bunney et al., 1999).

Second, affective atmospheres and ambiances are *situated*, since they are co-constructed by the bodies (human and non-human) in presence. As a result, urban affective atmospheres and ambiances are multiple on the one hand, and volatile on the other hand. When approached through the atmospheric lens, cities are understood as producing "a flow of experiences in which patients encounter elements that are assembled in various ways depending on how they see and practice 'the urban'" (Söderström et al., 2016, p. 109). Hence, studying the urban experience through an atmospheric perspective requires paying attention to the transitional moments, the moments of passage and switching between different affective atmospheres and ambiances.

Above all, it is a question of how patients experience these transitions. Those changes become particularly relevant when keeping in mind that the question of adaptation to new situations is a daily difficulty for people living with this diagnosis (Lysaker and Lysaker, 2008). From this point of view, the question then arises: what if the problem was not so much an ambiance or an affective atmosphere as such, but rather the transitions, the succession and sequencing of them, the alternation between aversive and pleasant ambiances and affective affective atmospheres, their permanent instability and unpredictable transitions?

Thirdly, an atmospheric approach of the relationship between individuals and the urban environment makes it possible to include a fundamental and often forgotten part of this space when it comes to the study of the effect of urban environment on mental health: its physical dimension. Golembiewski sees the absence of the physical component in epidemiology or etiology notably in the fact that the physical hypothesis contradicts an axiom rooted in modern medicine and its conception of mental health, namely "the assumption that the brain is a cognition machine and mental illness is a fault in the machinery, not the input (the phenomenological environment)" (Golembiewski, 2017). Integrating the material dimension stems particularly from the ambiental perspective as developed at CRESSON, where architectural features are of central importance. This is to ask the question of the role of the built city, of materiality, in the experience of urban space by people with mental disorders. According to Golembiewski, the physical environment and architecture, omnipresent in the urban environment, represent as much information and stimuli to be dealt with by city dwellers, and "[t]his is where the built environment may become psychotoxic" (Golembiewski, 2017).

From an "urban stress" perspective, the notion of atmosphere opens the door to an integrative and multidimensional approach from an emic perspective. Such an approach should contribute to a deeper understanding of what in urban life can be experienced as a source of stress and discomfort, or the opposite as an environment of well-being and comfort.

As showed, an atmospheric approach should help honing how questions around inter-sensorial perception, transition between ambiances and the built environment impact on micro-stress experiences of patients. The two registers of experience described by ambiance on the one hand and affective atmosphere on the other provide the conceptual framework for researching the impact of urbanicity on individuals diagnosed with schizophrenia through an innovative methodological apparatus, aiming to map people's embodied reaction to urban environment.

2.5.7. Methodological perspectives

The aim of this section is not to provide a robust methodology, which would be beyond the scope of this paper. Rather, its objective is to sketch out a methodological framework which builds on the above-discussed conceptual distinction. To do so, it is suggested to turn to a mixed methodological approach combining qualitative methods for the study of ambiances on the one hand, and *biosensing* approaches on the other.

From the outset, it is worth noting that the shared spatial perspective of ambiance and affective atmosphere leads inevitably to an *in situ* approach, where situations and experience of those situations are necessarily studied *hic et nunc*. An atmospheric approach, be it through ambiance or affective atmosphere, is based on an immersion in the surrounding world. Thematizing experience in this perspective leads to portray what it is like to be immersed in an environment (Thibaud, 2013, p. 6). Not only is an *in situ* method inherent to an atmospheric approach, it is also necessary for a more fine-grained understanding of the city/psychosis nexus. According to Myin-Germeys et al. (2009), daily life experience has been a black box within research on psychopathology and it is time to open it. The authors argue that "the study of persons in the context of normal daily life may provide a powerful and necessary addition to more conventional research strategies in psychopathology" (p. 1533). We already have mentioned the importance of minor stress events in the onset of psychosis, and Kimhy et al., (2010) point the absence of research investigating this relation *in situ*:

> Given that psychosis, stress, and arousal are variable phenomena that can fluctuate considerably over brief periods of time, the elucidation of their relationships is contingent on the availability of a methodology that allows for the ambulatory, high time resolution simultaneous assessment of the psychological and physiological indices of stress and psychosis during daily functioning. (p. 1133).

With urbanicity identified as of crucial importance in the etiology of psychosis, it becomes evident that such a perspective needs to be implemented in urban contexts. While empirical research on ambiance is very rich and well documented, quite the contrary is the case when we turn to affective atmosphere: "There is a distinct lack of writing on what research methods might be fruitfully employed in attending to atmospheres; it is not obvious how we should go about researching atmospheres […]" (Adey et al., 2013, p. 302). From that point, the question is "[h]ow can the sphere of empirical social research be re-composed so that it resonates with the concept of affective atmospheres?" (Michels, 2015, p. 258). In order to be able to make a productive proposal to this call, and in coherence with the discussion held above, the central question is less to study what ambiance and affective atmosphere *are*, and rather focus on

what ambiance and atmosphere *do* (Thibaud, 2015; Ash, 2013).

In recent years, *biosensing* — an "umbrella term for a variety of different somatic measures" (Osborne & Jones, 2017, p. 160) — has been advanced as "offering the potential to explore participants' reaction at an embodied level, beyond the subjectivity of self-reporting" (p. 160). Among these physiological indicators, electrodermal activity (EDA, also called skin conductance) is considered to be a stable index of the activation of the autonomic nervous system (Subotnik et al., 2012), which is associated with different emotional and cognitive states, as well as attention (Dawson et al., 2000; Critchley 2005; Belzung 2007; Boucsein 2012). Hence, EDA is considered to be a useful and valid index for various psychological processes (Dawson, et al., 2000, p. 204; Boucsein 2012), and has become the most widely used biosignal in the history of psychophysiology (Dawson et al. 2000; Belzung 2007, p. 30; Boucsein 2012), as well as in psychology and neuroscience (Belzung 2007, p. 30). Recently, non-invasive portable EDA monitoring devices have been made commercially available, allowing to collect data in situ. With these recent developments, biosensing methods have gained popularity within social sciences, especially in fields interested in people's experiences, such as mental health research (Cella et al., 2017), urban studies (Hogertz, 2010) or tourism (Kim & Fesenmaier, 2015). Together, these studies provide convincing evidence of the usability of these new methods. Osborne and Jones (2017) offer a brief review and reflection on these new methods in geography, and so do Torus and Keshavan (2018) concerning research in mental health. While both identify the powerful potential of these tools, they also identify new challenges for research, be it on practical, analytical or ethical level.

As it has been made clear earlier in this paper, the unconscious and involuntary bodily reactions assessed by biosensing can also be linked to affect, or more precisely to the registration of affect activity in bodies. Hence, I suggest here to turn to these physiological measures, in order to produce empirical data in coherence with the conceptual approach suggested by affective atmospheres as discussed in this paper. I am well aware that this is not the only way to propose an empirical application of affective atmosphere, and moreover, I do not claim that this measure is a way to quantify *affect* in itself, but rather a method to capture how a body is affected by environment, at a level not (yet) registered and mediated by consciousness, as highlighted previously. In other words, it allows to capture the "third realm", the registration of affective activity human bodies mentioned by Ellis, Tucker and Harper (2013). Nevertheless, we have to keep in mind that data collected through monitoring of EDA or other physiological data do not provide emotional states of participants (Dawson, et al., 2000), nor does it take in account contextual factors (Osborne & Jones, 2017). Hence, it is crucial, in order to obtain fine grained data of how people diagnosed with schizophrenia interact and respond to environment in daily life, to combine this method with qualitative – narrative and observatory – data. Here we may turn to the literature on ambiance, as scholars at CRESSON have been very much involved in developing innovative and adequate methodologies allowing to study ambiances. One of the most well-known tools for assessing how people experience ambiance is the commented city walks

(*parcours commentés)* developed by Thibaud. For a presentation of this method in English, see Thibaud 2013b.

The methodological suggestions made here remain at a tentative level and will be further developed in a forthcoming paper dedicated more specifically to the strengths and weaknesses of biosensing research tools, as well as to the way the physiological dataset may be analysed and integrated with ethnographical data. Nevertheless, it appears that turning to a combination of somatic and qualitative data allows to gain access to an embodied experience of urban environments. When combined with precise locational analysis (through GPS tracking) of the reactions of participants in the urban context, this mixed- method approach allows to obtain fine-grained data of the emotional and stress relationship individuals have with the urban environment in daily life situations. This is even more important when we want to capture where and why situations are source of stress.

2.5.8. Conclusion

Ambiance and affective atmosphere are raised in this paper as a conceptual framework "for examining situated place experience" (Buser, 2014, p. 229), or for studying how places feel as Jones and Jam (2016) say. The shared spatial perspective of ambiance and affective atmosphere highlighted in this paper has allowed to identify three research gaps in the study of the entanglement of urbanicity and psychosis, and, moreover, it leads to capture the way people diagnosed with schizophrenia experience cities in situ, which has been showed to be crucial if we seek to better understand the relations between mental illness and the cities we live in.

Furthermore, the article draws out the differences between the concepts of ambiance as conceptualized in French research on architecture and urban sociology on the one side, and affective atmosphere as theorized in recent Anglo-Saxon human geography on the other. The affective dimension refers to an immediate bodily perception, which intervenes even before the consciousness is involved, while ambiance rather points the conscious level of perception of urban environment. This distinction opens the way to the study of how the urban environment is perceived by the senses and mediated by conscious reflection upon it, as well as how this environment is experienced by the bodies, upstream of cognition.

And finally, in suggesting *biosensing* methods as adequate for the study of the pre-reflective domain of experience pointed out by the notion of affective atmosphere — and not for measuring affect itself — the article suggests a possibility to reconcile theoretical considerations with empirical outlooks. Moreover, it has been argued that the theoretical couple of ambiance and affective atmosphere provide fertile conceptual ground from which to capture embodied urban experience of people diagnosed with schizophrenia, and therefore contributes to a finer understanding of the city/psychosis nexus.

2.6. Research Questions

Building upon the discussion held so far, in this concluding section of the research framework, I present the main research question that guides my research. In sum, social and environmental stressors have been found to be of primary importance in understanding the association between urban environment and psychosis risk, as is the inability to relieve stress (Gong et al. 2016). Moreover, it has been argued that the way stressors relating to the urban environment are perceived is contingent on the mental health and wellbeing of the perceiver (Corcoran et al., 2017). Thus, experience-based studies that "start from the notion that lived experience and sense making of subjects are crucial for analysing the effects of urban or natural milieus on mental health" (Krabbendam et al., 2020, p. 1104) appear as particularly promising in providing a rich and fine-grained account of urban characteristics that elicit stress. A relational and posthumanist stance within geography provides fertile theoretical ground for the study of these urban characteristics, how they are perceived and experienced. For these reasons, the approach proposed here is anchored in a *in situ* approach, working with persons having experienced a first episode of psychosis and persons with an at-risk mental state for psychosis, and the primary objective of the study is to explore and identify relevant social and geographical urban factors implicated in their experiences of discomfort, physiological arousal and stress. In addition, the conceptual discussion led me to develop an innovative methodological approach. The latter pushes the notion of experience onto unexplored terrain with regard to the city/psychosis nexus, since it conveys autonomic bodily stress reactions indexed by skin conductance. These questions are discussed more thoroughly in the second part of the dissertation.

Thus, the study is guided by the following research question:

> **How is the experience of the social and material urban environment involved in creating physiological arousal, stress and feelings of well-being in persons having experienced a first episode of psychosis and persons with at-risk mental state for psychosis ?**

I build on the notions of *ambiance urbaine* and 'affective atmospheres' as a conceptual lens, to breakdown this main research question into three research axes. As highlighted above in the first article, an atmospheric approach to the city/psychosis nexus foregrounds (i) the built environment, (ii) sensory perception and aspects relating to (iii) spatial transitions.

(i) The built environment is somewhat absent in the literature on the relation between cities and mental health, in the sense that it is mostly addressed through its absence: the availability or lack of (urban) green space. With regard to psychosis, residential pattern analysis showed that persons with psychosis reside in neighbourhoods with significantly fewer green areas compared to the general population (Boers et al., 2018). Moreover, green space availability in residential areas has been identified as protective against schizophrenia, with the strongest effect during childhood (Engenmann et al., 2018). Conversely, "[l]iving at the lowest amount of green space was associated with a 1.52-fold increased risk of developing schizophrenia compared to persons living at the highest level of green space" (Engenmann et al., 2018, p. 142). These results support the general finding that nature has a positive impact on health, one of the supposed mechanisms being a mitigating effect through stress relief (Engenmann et al., 2018). However,

this does not point to the stressful dimension of the built environment, and to the ways it can become "psychotoxic" (Golembievski, 2017).

Therefore, integrating the material dimension of the city – in order to ask the question of the role of the built city and its materiality in the experience of urban spaces by people with mental health disorders – is crucial. Certain properties of isovists, defined as the portion of space visible from a point of view, have been found to be correlated with physiological arousal in healthy participants (Hijazi et al., 2016). I draw on these results, to formulate the following sub-question:

> **How are the enclosure and openness of the built urban environment experienced and implicated in physiological arousal, stress or feelings of comfort in FEP and ARMS persons?**

(ii) Sensory perception as a research axis derives both from the conceptual framework presented above and from research on stress. The importance of sensory stimulation – especially noise – in urban space as a source of stress in persons with psychosis has been highlighted previously (Söderström et al., 2016). While these studies mostly focus on separate sensorial perception, we need to take into account the fact that we see, feel, touch and hear the city at the same time and we need to look at how our five senses work together, simultaneously and/or consecutively (Candau, 2010). Concurrently, the effects of (multi)sensory perception of urban and green environments on physiological stress relief has been explored in lab settings, working with healthy persons (Hedblom, 2019). The authors compared the effects of visual, olfactory and auditory stimuli on physiological stress recovery (indexed with skin conductance). This study showed that "park and forest, but not the urban area, provided significant stress reduction" (Hedblom, 2019, p.1) and that "[h]igh pleasantness ratings of the environment were linked to low physiological stress responses for olfactory and to some extent for auditory, but not for visual stimuli" (p.1). This leads to the following sub-question:

> **What role does visual and intersensory perception of the urban environment play in physiological arousal, stress or feelings of comfort in FEP and ARMS persons?**

(iii) The notions of *ambiance urbaine* and affective atmosphere both insist on the situatedness of the perception of the environment and on the entanglement of perception and movement. Since walking through the city engages mobility and movement, this produces spatial sequences and transitions between them, which refer to the effects of the changes in urban scenery one experiences along the path. An atmospheric approach examines the effect of these spatial sequences and transitions in the experience of urban environments. As such, it overcomes a limitation of the study by Hedblom et al. (2019) mentioned above, especially with regard to visual perception. Working with 360º pictures of nature or urban environments, the study failed to take movement into account on two levels. First, it neglects the fact that, most of the time, the perceiver is not static, but rather moving throughout the city. And second, it does not capture the fact that the visual panorama one sees in a city is not static either; things are moving. In addition, recent studies working with skin conductance in urban environments highlight the importance of spatial transitions in eliciting physiological arousal, rather than a specific location, considering that "changes in a sequence of spaces along a path may be reason for

positive or negative arousal" (Hijazi, 2018, p. 12). These considerations lead me to a third sub-question:

> **In what ways are spatial transitions relevant to FEP and ARMS persons in their experience of urban environments with regard to physiological arousal, stress and discomfort?**

The three sub-questions presented above are addressed empirically in the third peer-reviewed article (chap. 4.2). Before that, the next part of the dissertation proposes a methodological discussion on the need for a biosocial approach to the urban/psychosis nexus, as well as it outlines the methods, procedures and strategies put in place to answer my research questions.

3. Methodological Framework

3.1. Introduction

Everyday life experiences have been a black box within research on psychopathology in general and there have been calls for a more experience-based approach, since the "study of persons in the context of normal daily life may provide a powerful and necessary addition to more conventional research strategies in psychopathology" (Myin-Germeys et al., 2009, p. 1533). Concerning the relation between cities and psychosis, geographers and ethnographers have responded to this call and started to pave the way for such an approach. Bister et al. (2016) looked at how persons living with mental health problems create and use urban 'niches' to help them handle their difficulties; Duff explored how the combination of elements in cities can constitute 'enabling places' (2012) and 'atmospheres of recovery' (2016); Söderström et al. (2016; 2017) studied how situations of stress and comfort emerge in persons' encounters with the city; Li et al. (2019) combine a survey, an ethnography and an app on mobile devices to report psychic states in work on migration and mental health in Shanghai; Codeluppi (2019) explored the way the fluctuating dynamics of psychosis affect young patients' engagement with the urban milieu, and she also highlighted the specific resources they mobilise in their engagement; and Bieler (2021a; 2021b) explored how the everyday lives of persons living with severe mental disorders relate to the social and material dimensions of urban environments as well as to the psychiatric care infrastructures and public administration.

In addition, the call for a shift towards real-life studies has also been made with regard to the relationship between stress and psychosis, with scholars estimating that "the elucidation of their relationships is contingent on the availability of a methodology that allows for the ambulatory, high time resolution simultaneous assessment of the psychological and physiological indices of stress and psychosis during daily functioning" (Kimhy et al., 2009, p. 1133). Moreover, as mentioned above, the relation between cities and psychosis more generally has been identified as a site where new collaborative engagement between the life sciences and social sciences could prove to be fruitful when it comes to understanding the underlying mechanisms of this association.

> "How […] can sociologists *not* engage with knowledge that their colleagues from the life sciences and biomedicine are generating about the ways in which urban experiences, exposures and insults might be traced in the very molecular make up of bodies and brains?". (Fitzgerald & Rose, 2015, para. 3, emphasis in original).

In other words, urban mental health constitutes one of those themes where the need for interdisciplinary collaborations on the elucidation of biosocial processes is obvious. It is a testimony of a general epistemic context where "the life sciences, broadly conceived, are currently moving toward a more social view of biological processes, just as the social sciences are beginning to reincorporate notions of the biological body in their investigations" (Meloni et al., 2018, p. 2). My doctoral research is a (tentative) response to these calls.

In this second part of the dissertation, I outline my research design and discuss the reasons for my choices. My doctoral research is situated at the intersection of various fields and research trends. It conveys human geography and its qualitative sensitivity, the emerging trend of ambulatory physiological research and psychiatry. As a result, I developed a unique methodological configuration, as an attempt to overcome some of the limitations of the current

investigations into the city/psychosis nexus. Based on a combination of ambulatory skin conductance monitoring, mobile qualitive interviews and contextual data (GPS and video recordings) the study design aims to refine current understandings of the notion of 'urban stress' for persons living with early psychosis and persons with an at-risk mental state for psychosis. Hence the need to explain my methodological choices and situate them within broader methodological debates. This is the aim of this second part of the dissertation.

This part is structured as follows: First, I discuss the productive potential of a 'revitalized' biosocial geographical thinking and researching on urban mental health, through the methodological proposition that underpins my study. This discussion is held in chapter 3.2, by means of the second peer-reviewed article. Second, I provide information on the research setting and participants (chap. 3.3) and on the research procedure and methods I used to carry out the study (chap. 3.4)[21]. Following that, I discuss the ethical aspects of my research (chap. 3.5) and propose a personal reflection on the general research process I implemented (chap. 3.6), before concluding with the methodological framework (chap. 3.7).

[21] These two chapters are complemented with more information on the participants as well as on the methods used to analyse the data, which are discussed in the third part of the thesis, specifically in the third peer-reviewed article (sect. 4.2.5).

3.2. Article II: How environments get to the skin

Marc Winz & Ola Söderström

3.2.1. Foreword

The full title of the paper is "How environments get to the skin: biosensory ethnography as a method for investigating the relation between psychosis and the city", and it is published in open access[22]. This article was published in *Biosocieties* online in 2020, and figures in volume 16, issue 2, which was published in June 2021. The journal *Biosocieties* strives to break disciplinary boundaries, both within the social sciences and humanities, and between these fields and the life sciences.

3.2.2. Abstract

Epidemiological research in psychiatry has established robust evidence of the link between urban living and psychosis, but the situated experience of the city, as well as the precise ecology of psychosis remain largely unexplored. In this context, the aim of this paper is to discuss the productive potential of a 're-vitalized' biosocial geographical thinking and researching on urban mental health. We do so through a methodological proposition. First, we discuss the need for a biosocial approach to the city/psychosis nexus and argue that a broader biological view, beyond epigenetics and neurosciences and a more precise investigation of 'the social' need to be developed. Second, a telling and recurring motto of recent reflections on biosocial processes is to understand how the environment or the social 'gets under the skin'. We suggest examining a specific place in this pathway, the skin itself. This leads us to expose a methodology using electrodermal activity (EDA), combined with ethnographic observations and interviews, as a strategy for analysing ecological processes in psychosis. In doing so, we discuss the potential of 'biosensory ethnographies' in studies of urban mental health and more broadly as a biosocial approach to the geography of health.

Keywords: Methodology; Biosocial processes; Urban mental health; Skin conductance; Ethnography; Geography

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3.2.3. Introduction

Some research questions can lie dormant for many years and are then suddenly woken up by a busy and variegated crowd of scholars. This has recently happened to the question of the urban origins of psychosis. Speculations about the role of urban life in the frequency of mental illness have a long pedigree. J.R. Hübertz, a physician, showed in 1839 that there were more persons reported as being mentally ill in Copenhagen than in the Danish countryside (Shorter, 2017). Surveys during the second part of the nineteenth

[22] Winz, M., & Söderström, O. (2021). How environments get to the skin: biosensory ethnography as a method for investigating the relation between psychosis and the city. *BioSocieties*, *16*(2), 157-176.

century on the geographical distribution of mental illness in Scotland and in the US came to similar conclusions (Bloom, 2002). Comforting a bourgeois moral discourse on cities—seen as places of vice and corruption—these studies fed an 'urban hypothesis' regarding mental health. In 1939, Robert E. Faris and H. Warren Dunham's study of mental health in Chicago then "became the most influential work in the development of the 'ecology' hypothesis" (Bloom, 2002, p. 70). But in the subsequent period dominated by a biological model of mental health (Read et al., 2009), this hypothesis disappeared from the radars of research, except for a few rare exceptions.

However, since 2000, a swelling wave of studies in psychiatry has picked up this urban hypothesis. These studies notably show that higher prevalence of schizophrenia[23] in cities—a finding replicated in many European and North-American studies— cannot be explained by the fact that a higher proportion of people at risk are to be found in urban centers (Kelly et al., 2010; Vassos et al., 2012) and that there is a linear dose–response relationship between the risk of developing schizophrenia and the degree of urbanization in the first 15 years of upbringing (Pedersen & Mortensen 2001a). In other words, the more years lived in a city during childhood and the greater the degree of urbanization, the higher the risk of developing schizophrenia (Pedersen & Mortensen 2001a). This phenomenon increases in deprived neighbourhoods (Bhavsar et al., 2014). It is of importance to note here that a recent cross- sectional epidemiological study of 42 low- and middle-income countries indicates that the role of urban living in psychosis "may be exclusive to high-income countries" where most studies have been conducted so far (Devylder, 2018, p. 7). In other words, the variety of urban societies and cultures must be better taken into consideration. Moreover, a recent literature review on the association between psychosis and the city shows that, even in relatively homogeneous high-income countries "urbanicity effects are diverse, and it is unclear why international differences occur. Possible explanatory factors include difference in social cohesion, control and isolation in rural areas; differential pressures of modern urban life or geographic variation in diet, climate or exposure to disease agents" (Fett et al. 2019, p. 238–239).

Recently, some social scientists (Callard & Fitzgerald, 2015; Fitzgerald et al., 2016) have identified this research question as emblematic of new sites of encounter between the life sciences and the social sciences (Fitzgerald & Rose, 2015). The way these new alliances can be approached in the context of urban mental health is diverse and contingent on differing time-scales—from short-term stress peaks to intergenerational transmission—and geographic scales—from microbiological processes to regional prevalence differences on a planetary scale. Which aspects of the biological, the 'social', the 'environment' or 'the city' should be investigated and put in relation are highly contested and confused. Medical research tends to fumble with the different definitions of social at play: social capital, social cohesion, socio-economic status, deprivation, etc. The same applies to the

[23] The term "schizophrenia" is highly controversial: see Read et al. (2004). Many authors, even within psychiatry, suggest dropping the term altogether (van Os 2009). We use it in this paper when referring to psychiatric literature that uses the term. Otherwise, we use the more neutral 'psychosis'.

dimensions of the biological: cortisol levels, grey matter, biomarkers in epigenetics, etc.

The aim of this paper in this context is to explore the productive potential of a "re-vitalized" (Fitzgerald et al., 2016) geographical thinking and researching about urban mental health through a biosocially inspired ethnographic approach, in which "both body and environment [are] to be repositioned as active components in fluid health and place relationships, acting in interchange and accumulation over time" (Prior et al. 2019, p. 544). We do so through a methodological proposition: the paper describes a mixed method study protocol – combining ethnography and biosensing – for investigating the urban/psychosis nexus and discusses the rationale behind it. First, we discuss the need for a biosocial approach to the city/psychosis nexus and argue that a broader biological view, beyond epigenetics and neurosciences and a more precise investigation of 'the social' needs to be developed in urban mental health research. Second, we observe a dearth of biosocial experimentation on urban mental health. Therefore, the second goal of this paper is to suggest a method that looks at an unexplored contact zone between the biological and the social: the skin. A telling and recurring motto of recent reflections on biosocial processes is to understand how the environment or the social 'gets under the skin'. We suggest examining a specific place in this pathway, the skin itself as one of the crucial passage points in this biosocial process. This leads us to a methodology using electrodermal activity (EDA) as an indicator of ecological processes in psychosis. The advantage of EDA, we argue, is that it captures pre-cognitive relations to the environment, but we also suggest that these measurements need to be complemented by ethnographic observation and interviews. We then discuss the potential of biosensory ethnographies (Çorlu & Yantaç, 2016) in studies of urban mental health and more broadly as a biosocial method in the geography of health. This suggestion, we argue in our conclusion, is a means of displacing the focus of epigenetics and neurosciences from the 'bio' to the 'social' in the biosocial pathways related to urban mental health.

3.2.4. Why do we need a biosocial approach to the city–psychosis nexus?

The recent development of studies on urban mental health in psychiatry has predominantly used a spatial epidemiological approach familiar to geographers (Giggs, 1973) pioneered by Faris and Dunham in the 1930s, although using more sophisticated tools and data on national (e.g.: Pedersen & Mortensen 2001b; Sundquist et al. 2004) or neighborhood scales (e.g.: Kirkbride et al., 2007; Van Os et al., 2000). However, as Philo (1986, p. 40–41) remarked over thirty years ago when discussing this strand of research, in these approaches, the mentally ill are "little more than dots on maps" and "this enterprise has paid little attention to the way in which many early ecologists softened the objectifying tendencies of their project by viewing the city-dweller as an intelligent, sensitive and creative subject" (p. 40). Geographers, sociologists, anthropologists and psychologists of mental health have since then animated these dots and given voice to mental health service users and their carers (see among others: Desjarlais, 1997; Estroff, 1985; Knowles, 2000; Parr, 2008). However, both the bird's eye view of spatial epidemiology and the street-level view of ethnography have largely disregarded the study of biosocial pathways in urban mental

health. Today, the association between the city and psychosis is the site of various investigations that fall within the scope of biosocial approaches. In this burgeoning field, gene–environment interaction, epigenetics and neuroscience seem to be the major fields where scholars engage.

Within epidemiological genetic studies, “gene-environment interactions aim to describe how genetic and environmental factors jointly influence the risk of developing a human disease” (Hunter, 2005, p. 286). Gene-environment interaction models have been put forward to explain severe mental illness (Uher, 2014), including schizophrenia (Krabbendam & Van Os, 2005; van Os, et al. 2008; van Os et al., 2010) where evidence suggests “that genes may have an impact on risk for psychotic symptoms by altering environmental sensitivity” (van Os et al., 2010, p. 208). Combined with the evidence highlighting the association between urban areas and psychosis, Van Os and his colleagues consider gene-environment interaction research as of crucial importance for understanding the entanglements between cities and psychosis. Gene–environment interactions can unfold in two ways: (i) environmental effects can be conditional on a person’s genotype; and/or (ii) environmental exposure/experience can impact on genes, and alter gene expression (Moffitt et al., 2005; Van Winkel et al., 2008). This latter mechanism is known as epigenetics. Bridging two major aetiologic factors – the environment and the genes – epigenetics is considered by some to hold great potential for the genetic understanding of environmental factors of psychotic disorders (Kubota et al., 2012) and has recently become of great interest in mental health research (Cromby et al., 2019; Rutten & Mill 2009; Toyokawa et al., 2012), notably with regard to schizophrenia (Maric & Svrakic 2012) and to the urban origins of mental disorders (Galea et al., 2011, p. 401). However, epigenetic explanations of psychosis also meet with some skepticism: Rutten and Mill (2009, p. 1051) for instance argue that, direct and replicated evidence for clear epigenetic mediation of environmental exposures in psychosis is currently very sparse. […]. While it is easy to theorize about the role of epigenetic processes in mediating susceptibility to psychiatric disorders, actually investigating these modifications at a molecular level is not so straightforward.

The second main type of biosocial approach to the city/psychosis nexus is focused on brain activity and on neural processes. Andreas Meyer-Lindenberg leads a research group interested in characterizing risk mechanisms for severe mental illness (Meyer-Lindenberg & Tost 2012). Interested in the impact of urban living and urban upbringing on neurological responses to stress (Lederbogen et al., 2011), Meyer-Lindenberg and his colleagues observe an overall higher sensitivity or an over-responsiveness to stress in participants with histories of urban living, which may represent a plausible pathway to understanding the links between urban living and psychosis. However, such an approach fails to provide information about what areas and what aspects of the city are most stressful. Within neuroscience, but from another perspective, neurotransmitters (dopamine) and the neuroendocrine system (hypothalamus–pituitary–adrenal, HPA axis) are the focus in studies following the ‘sensitization hypothesis’ for schizophrenia. Sensitization refers to the “process whereby repeated intermittent exposure to a given stimulus results in an enhanced response at

subsequent exposures” (Weidenauer et al., 2016, p. 1) and is “thought to play an important role in the way how psychosocial stress such as migration, urbanicity, and childhood trauma may increase the risk for psychosis” (Van Winkel et al. 2008, p. 1996). While HPA axis dysregulation and the dopamine hypothesis are generally researched separately, Walker and Diforio (Walker & Diforio 1997), propose a ‘neural diathesis-stress model’, integrating the two, “suggesting that the HPA axis may trigger a cascade of events resulting in neural circuit dysfunction, including alterations in dopamine signaling” (Van Winkel et al., 2008, p. 1997).

These approaches do not make strict separations between social and biological lives, but think in terms of continuity (Fitzgerald et al., 2016, p. 150). Nevertheless, while these methodologies give space to social variables, critics argue that they still strongly privilege biological determinants: “if the environment is included at all, as, for example, in epigenetics, there is a tendency either to marginalize its impact or to translate it into purely biological terms” (Johnstone & Boyle, 2018, p. 169). Furthermore, and more importantly in our view, even in sophisticated epigenetic and neurobiological accounts of urban mental illness, the dynamics of ‘the environment’ get scant attention, and the experience of living in urban areas even less so. What we are usually presented with, instead, is a list of heterogeneous ‘factors’. (Fitzgerald et al., 2016, p. 152)

Such approaches fail to provide an ecological (temporal and spatial) analysis of the actual encounter of the participants with the urban; it does not provide the means to capture the situated experience of persons living with mental health problems or the precise ecology of mental illness (Söderström et al., 2016). One could be tempted to simply oppose the decontextualized gaze of psychiatric research to the urban ethnographies of mental health in the social sciences. But attitudes are changing. Recent studies in psychiatry have suggested, to use the subtitle of one of these articles, opening “the black box of daily life” (Myin-Germeys et al., 2009). Drawing on a vulnerability-stress model (Zubin & Spring, 1977) of the aetiology of psychosis, this strand of research aims to more closely analyse ill/ health–environment relations as observed in situ. One of the first experiments in this direction was a walk in Camberwell, London, looking at symptoms before and after a walk in a busy shopping street for persons with persecutory delusions (Ellett et al., 2008; see also: Freeman et al., 2015). This type of experimental procedure is important because it initiates a move out of the laboratory and the clinic, as well as away from epidemiological mapping to consider ordinary situations in cities. But it does not allow precisely locating urban stress as what happens during the walk itself. Other in situ studies in psychiatry suggest working with ecological ‘momentary assessment strategies’ where participants are asked to report regularly on their psychic state in the different urban contexts they encounter, using devices such as connected wristwatches or mobile phones to geolocalise the reports (Kimhy et al., 2009; Myin-Germeys et al., 2009; Torous & Keshavan 2018). However, as we argue below, these methods are limited by the fact that they require conscious reporting by participants. In summary, there is a small body of work in psychiatry that has focused down from level of the epidemiological

maps of mainstream research to get closer to persons' ordinary experiences of the city.

In response to the mainly decontextualized accounts of 'urbanicity' in the life sciences, Fitzgerald et al., (2016) call for a "revitalized sociology" of urban mental health, a sociology that is "much more ontologically ambitious than the epidemiological demonstration of the 'social determinants' of health" (p. 151). While suggesting four areas of engagement of sociology with the life sciences—attending to life-as-such; bioeconomies of urban experience; intra-actions of bodies and cities; biological localities – they do not offer suggestions as to how, methodologically, social scientists could achieve such engagement. Recent work stemming from different social sciences has been interested in similar questions. Such research has highlighted how persons living with mental health problems create and use urban 'niches' to help them handle their difficulties (Bister et al., 2016); how such niches or 'bubbles' are constituted and may burst (McGrath et al., 2019); how different elements in cities may come together and constitute 'enabling places' and 'atmospheres of recovery' (Duff, 2012, 2016); how—using video elicitation and video analysis to analyse it—stress in cities is experienced and handled (Söderström et al., 2016, 2017); and how, through ethnography and mobile app devices, the links between migration and mental health in Shanghai can be understood (Li et al., 2019). This body of partly interdisciplinary work moves towards the forms of collaboration between the life sciences and the social sciences suggested by proponents of re-vitalized social sciences. But there is still very little work on the place to be given to biological processes in ethnographic studies (Pitrou, 2015) or how to productively combine biological end ethnographic data[24]. This is what we discuss in the following section.

3.2.5. Towards a re-vitalized geography of mental health

In what follows, we want to contribute to this methodological debate by discussing the potential for drawing on physiological and qualitative data, combining biosensing and ethnography, in providing a more fine-grained understanding of the way people diagnosed with psychosis experience urban environments. To this end, we discuss the biological variables we suggest incorporating in our methodological proposition. Subsequently, we will discuss what we understand by 'social', and how these bio and social datasets may be merged. In doing so, we also want to reclaim biosensory ethnography (Çorlu & Yantaç 2016) as part of a broader research trend that goes under the banner of 'biosocial', beyond epigenetics and neurosciences. Our suggestion seeks to operationalize the relational and dynamic aspects of the encounter between life and environment, taking into account both human and non-human entities. The relational ontology that underpins our suggestions resonates largely with what can be understood as a vitalist geography, since key facets of vitalist geographies have been defined as an attention to "sensing material worlds", "life as practice" (or a dwelling perspective) and "more-than-human agency" (Greenhough

[24] The term "bioethnography" has been used to describe a collaboration platform between anthropologists and environmental health scientists that combines ethnographic observation and biochemical sampling (Roberts and Sanz 2018). But as the authors recognize this is still in a preliminary stage.

2016). These elements are at the core of the methodological framework proposed in this paper. Furthermore, in mobilizing a biosensory ethnography, our approach takes up the idea of 'plasticity'—understood as the "modifications and adaptation of the body mediated by environmental stimuli, social conditions and life experiences" (Chiapperino & Panese, 2021, p. 4) – which is also present in a vitalist account of the encounter between bodies and milieus (Greenhough, 2016).

3.2.6. The 'bio' in urban mental health

Biosensing refers to the measurement of various somatic and physiological variables such as heart rate and blood volume pulse, skin temperature, and skin conductance, electroencephalogram, breathing patterns, etc. In recent years, biosensors—the devices allowing monitoring these variables—have become portable and affordable for both researchers and everyday users. These new tools have been advanced as "offering the potential to explore participants' reactions at an embodied level, beyond the subjectivity of self-reporting" (Osborne & Jones, 2017, p. 160), generating a wide range of new investigations in various fields such as urban and architectural studies, tourism, marketing and health studies. Within mental health research, these technologies have been applied in several areas: stress and anxiety, cigarette smoking, alcohol use disorders, illicit substance use, autism, mood disorders and attention-deficit/hyperactivity disorders (Adams et al., 2017). More generally, mHealth (mobile health), which is sometimes used to refer to this growing field of mobile (self-)monitoring of health-related variables, is believed to hold great potential for personalized care and intervention, notably in the field of mental health (Price et al., 2014). However, to date, the number of published studies in psychosis research using mobile biosensing is still scarce and findings preliminary. Torous and Keshavan (2018, p. 1) for instance, highlight the potential of mobile biosensing, noting that "beyond offering new tools to better quantify the lived experiences of those living with a diagnosis of schizophrenia, digital phenotyping also offers a new target for biologically focused research". Other studies provide some promising first results, notably with regard to feasibility and acceptance of the use of mHealth devices in mental health research (Cella et al., 2018).

To experiment with the potential of these technologies, we have chosen the contact zone between what is usually understood as biological and social: the skin. More precisely, we suggest turning towards electrodermal activity, also called skin conductance. EDA refers to changes in the electrical properties of the skin, due to autonomic activation of sweat glands, which are under the control of the sympathetic branch of the autonomic nervous system, associated with the 'fight or flight system', also called acute stress response. EDA is considered to be a stable index of the activation of the sympathetic nervous system (Dawson et al., 2007), "both among patients with schizophrenia and among those in the normal population [sic] (e.g. Schell et al., 2002)" (Subotnik et al., 2012, p. 1035). To our knowledge, EDA activity has not been put to use in situ in urban environments for the monitoring psycho- physiological arousal of people living with a diagnosis of psychosis. However, there is indeed a growing body of work assessing EDA with healthy participants in real world settings within cities (Alajmi et al., 2013; Bergner et al., 2013; El Mawass and Kanjo 2013; Hijazi et al., 2016; Hogertz 2010; Kim and

Fesenmaier 2015; Li et al., 2016; Zeile et al., 2015). Furthermore, EDA has been used in laboratory studies as a psychophysiological indicator of arousal in participants living with a diagnosis of psychosis (Lincoln et al., 2015), and it has been used in situ to detect autonomic signature of illness (Cella et al., 2018).

Changes in skin conductance have been closely linked to emotion, arousal and attention, as well as to responses to external stimuli (visual, auditory, gustatory) (Dawson et al., 2007, p. 159). Depending on the theoretical background in which the measurement is embedded, EDA has been used to determine either 'arousal' or 'general arousal', a 'state of excitement', 'cognitive processes', 'attention', 'stress', 'emotions' or 'emotional processes'. Hence, EDA has become the most widely used biosignal in psychophysiology (Belzung 2007; Boucsein 2012; Dawson et al., 2007): an indicator of both psychological and physiological arousal (Braithwait 2013; Chen et al., 2015). However, despite numerous attempts, it has as yet proved impossible to link changes and patterns in EDA to any specific emotion (Belzung 2007; Boucsein 2012).

Therefore, to make sense of them, EDA measurements need to be grounded in a theory of emotions. There are two main approaches to emotion classification in affective sciences: theories of basic emotions; and dimensional models of emotion. Theories of basic emotions "posit that a discrete and independent neural system subserves every emotion" (Posner et al., 2005, p. 1). Six basic emotions (anger, fear, happiness, disgust, sadness and surprise) have been identified (Ekman 1992). Basic emotion theories have been dominant in psychiatry (Posner et al., 2005), even though they lack sufficient empirical evidence: "the neural foundations of basic emotions have not yet been validated, peripheral physiological correlates for the basic emotions have not been established" (Posner et al., 2005, p. 718). Consequently, within psychiatry, calls have been made for a conceptual shift towards dimensional models developed in psychology (Posner et al., 2005).

Dimensional models suggest that emotions are not fundamentally different from one another. It is considered that the same neurophysiological processes are responsible for all emotions. Most dimensional models identify two dimensions: valence and arousal (or intensity). Within the variety of two-dimensional models, the predominant ones are the circumplex model of affect; the positive activation-negative activation (PANA) model; and the vector model, all of which incorporate the two dimensions of valence and arousal. We choose the circumplex model of affect proposed by Russel (1980), because the vertical axis – arousal dimension – has been correlated to skin conductance and to activity in the sympathetic nervous system (Posner et al., 2005, p. 720). Hence, "[f]ear, for example, is conceptualized by circumplex theorists as a neurophysiological state typically involving the combination of negative valence and heightened arousal in the CNS [Central Nervous System]" (Posner et al., 2005, p. 719).

This model helps to clarify what can be deduced from EDA as an indicator – namely someone's state of arousal. EDA only indicates levels of arousal or excitement "elicited by both pleasant and unpleasant stimuli" (Hogertz 2010, p. 32), and not the valence (positive or negative) of the experience, or the nature of emotions (joy, grief, amusement, anger, fear, pride, anxiety,

pain, etc.). In other words, the meaning of the affective/physiological response is not captured by EDA. We are aware that skin conductance is a limited and specific dimension of the 'bio' potentially involved in urban mental health research. Instead of the molecular traces tracked in epigenetics, for instance, we focus here on physiological reactions of arousal. Skin conductance has the advantage of being measurable with rather simple tools in ordinary daily life situations and it may be an indicator other biosocial processes at work. Furthermore, EDA does not provide contextual information: "[u]nless deployed within a mixed methods research design, […] the context for these somatic responses is missing; in essence, bio-sensing can capture the what but not the why" (Osborne & Jones,2017, p. 160, emphasis in original text). Therefore, there is a need for complementary qualitative approaches, such as self-reporting, (go-along) interviews and observation.

3.2.7. The 'social' in urban mental health

It is often considered that biosocial approaches are concerned with how the environment and our social experiences 'get under the skin'. In other words, the social environment acts upon our biological constitution, leaving traces in our bodies. The objects of epigenetic and neuroscientific inquiry are precisely those biological alterations and their implication for psychosis. In other words, the focus is on the 'bio', leaving the social relatively indefinite. Our suggestion is different, in that we propose to use the 'bio' to produce a more fine-grained understanding of the 'social' factors of cities that may be implicated in the onset and/or relapse of psychotic symptoms. In doing so, we propose an innovative methodological approach to the city/psychosis nexus situated between laboratory research and research 'in the wild' (Callon & Rabeharisoa 2003).

Most etiological models of psychosis include stress, often as a precipitating or triggering factor (Corcoran et al., 2003) and urban stress has been hypothesized as a plausible pathway relating psychosis to cities. But 'urban stress' is not sufficiently defined, remaining diffuse (Abbott 2012). Hence identifying which urban situations are the most stressful as well as why they are so, is of crucial importance (Abbott 2012, p. 164), also because this may be of importance for future urban planning. These experiences have to be captured dynamically, while they take place – 'in the film', rather than by static snapshots taken afterwards (in a laboratory, for example). In other words, such research draws necessarily on an *in situ* approach, in order to open the black box of daily life experiences in psychopathology (Myin-Germeys et al., 2009), and requires adequate and innovative methodology:

> Given that psychosis, stress, and arousal are variable phenomena that can fluctuate considerably over brief periods of time, the elucidation of their relationships is contingent on the availability of a methodology that allows for the ambulatory, high time resolution simultaneous assessment of the psychological and physiological indices of stress and psychosis during daily functioning. (Kimhy et al., 2009, p. 1133).

The potential for incorporating physiological data into such research has been put forward in a few of the previously-mentioned contributions. While these suggestions remain rather general and opening up a broad spectrum of possibilities, we take these considerations a step further.

Physiological data such as EDA gathered through biosensors are both useful and insufficient. They are useful because they give insight into the physiological response to the environment. This is of particular interest when working with people living with psychosis, as it has been shown that they often experience difficulties in recognizing their own internal states, and in expressing verbally what they feel (Kimhy et al., 2012; Lincoln et al., 2015; Peterman et al., 2015). In other words, this embodied non-discursive level of urban experience allows us to complement a ‘declarative mode’ of collecting data, where participants are asked to report on their experience. This is not to say that subjectivity is not important, as we argue in the next section. But biosensing captures people’s embodied experience dynamically and in situ, with regard to minor stress events that might not come to consciousness and/or that might not be verbalized by participants. This is even more important considering that small stress experiences and their accumulation could be of great importance in the onset of psychosis (Collip et al., 2008).

However, biosensing is insufficient on its own, since it offers only decontextualized somatic responses (Osborne & Jones, 2017). The question then is: what contextual data do we need to recontextualise these responses? The type of data needed is twofold. On the one hand, we need relevant data for assessing the valence or meaning of the physiological arousal indexed by EDA for participants. On the other hand, we need spatial and environmental data for assessing the ecological context of the reaction and getting an understanding of what precisely triggered the reaction. The combination of these datasets can be achieved through triangulation as we argue later in our paper.

Narrating urban stress

The subjective experience of persons living with a diagnosis of psychosis has been central to the phenomenological tradition in psychiatry and psychology since Karl Jaspers’ (1972; German original edition: 1913) early twentieth century advocacy of an empathetic understanding of psychosis. The phenomenological approach has been crucial for an understanding of psychosis as a disorder of the self, and more specifically as a problem of hyper-reflexivity and diminished self-affection (Sass 1992; Sass & Parnas, 2003). Moreover, the “sense of self and the sense of immersion in the world is inseparable. We are self-aware through our practical absorption in the world of objects” (Sass & Parnas, 2003, p. 430). However, empirical phenomenological accounts rarely take this world of objects into consideration in a systematic way. This lack of attention to materiality in phenomenology in general has been emphasized in post-phenomenology (Ihde et al., 2015). In psychiatric phenomenology, it is also related to the restriction of research to sites such as the clinic or medical offices. Participants are rarely accompanied, observed or interviewed in their daily life contexts. Geographers are among those social scientists who have been researching the most systematically subjectivity as situated in contexts composed of both human and non-human entities (e.g. Parr 2008), but some sociologies and anthropologies of urban mental health also take this approach (e.g. Duff 2016; Knowles 2000).

In previous work (Söderström et al., 2016; 2017), we have used video-recorded go-alongs and video elicitation with service users as means to produce narratives about their everyday experiences of the city. These methods have led us to re-specify, situate,

and attend to the complexities of, the ‘factors of stress’ described in medical research, such as density, deprivation or criminality. Compared to other methods, video-based methodologies have various advantages. In particular, in urban mental health research, they allow the production of narratives that are based on images of participants in action rather than on general questions often perceived by participants as abstract. They also allow a fruitful confrontation between an ‘emic’ interpretation by participants and an ‘etic’ interpretation by researchers of the same urban situations and trajectories (Söderström, 2019). Finally, video-based methods are a means to precisely grasp and situate ‘urban stress’. This should, we suggest, be pushed further in future research.

Situating and framing urban stress

While the narratives of participants allow gathering data on valence, environmental data are needed to capture salient elements in the physical urban environment that may be implicated in the emergence of stress or arousal. In urban studies using biosensing (Hijazi et al., 2016; Hogertz 2010; Osborne & Jones, 2017; Zeile et al., 2015), environmental and spatial data are collected in two ways. First, inclusion of a GPS tracking system allows researchers to trace the walker’s itinerary, and hence to georeference the participants’ electrodermal reactions and visualize them on maps. Nold (2004; 2009), calls this procedure biomapping. Taking EDA and other somatic measurements outside the lab encounters the difficulty of identifying the elements of the environment participants are reacting to. In research environments like labs, ‘stimuli’ are controlled and released on purpose, making it easier to associate stimulus and physiological reaction, but in the real world we are exposed to numerous and simultaneous variables that might elicit reactions (Osborne & Jones, 2017, p. 168). Nevertheless, while analysis of relevant environmental features is more complicated, this situation is representative of everyday mundane urban dwelling. Furthermore, and we will elaborate this below, a multisensory approach is central to a better understanding of the way people living with psychosis experience urban environments.

However, geolocalization is not enough and visual methods are needed to get a richer sense of the ecology of urban stress. As previously-mentioned, video-recorded go-alongs have a series of advantages that we see as crucial in urban mental health research. But the rich material that they produce must also be conceptually framed. As we have argued elsewhere (Winz, 2018), an ‘atmospheric’ approach can be helpful in highlighting aspects of urban environment and its experience not sufficiently taken into account in psychopathology. Such a perspective articulates built, sensory and social dimensions (Thibaud, 2013) of urban dwelling and brings the participants’ point of view of ordinary daily life experiences to the foreground (e.g. Duff, 2012). We suggest paying particular attention to three main components of the urban environment and the experiences of people diagnosed with psychosis: multisensory perception; the physical environment; and spatial sequences and transitions. We briefly discuss these three aspects below and show why they are of particular importance in urban mental health research.

First, while the importance of the sensory and its potential source of discomfort in the experience of urban space by people diagnosed with psychosis has been highlighted previously (Söderström et al., 2016), these studies mostly focus on one

particular form of sensory perception – e.g. sight or hearing or touch, etc. However, we see, feel, touch and hear the city at the same time and we therefore need to study how these four senses work together, simultaneously and/or consecutively (Candau 2010). Taking into account this simultaneous or inter-sensory perception of the environment should help to hone our understanding of sensory overload, defined in psychiatry as an excessive number of stimuli surpassing someone's ability to absorb them (Bunney Jr et al., 1999). Second, the built environment has been largely absent from urban mental health studies (McGrath and Reavey 2019). There is thus a need to integrate the materiality of the city into investigations in order to take account of its potential role in urban stress. Finally, approaching the urban experience through an 'atmospheric' perspective requires paying attention to the transitions between different situations, between different atmospheres. Transitions are important because, rather than spatial situations per se, changing sequences of spaces, for instance, when turning the corner of a road (Nold 2018), have been identified as contributing to eliciting arousal (Hijazi et al., 2016). Such changes or transitions become particularly relevant when working with people diagnosed with psychosis, since the question of adaptation to new situations is a daily difficulty for them (Lysaker and Lysaker 2008).

Such 'atmospheric' approach consists in focusing on the immersive experience of the social, material and sensory environment. We are aware that in focusing on variables of the immediate encounters between the participants and the city, we do not consider more structural social dimensions that are of importance with regard to the city–psychosis entanglement, such as social deprivation and social cohesion, ethnicity and segregation or discrimination. The methodological proposal we discuss here follows the argument we develop elsewhere that an experiential approach allows the observation of the role of specific urban places and situations, and hence contributes to a more fine-grained understanding of the city/psychosis nexus. Moreover, while there is already an important body of studies addressing the structural dimensions of urban living (Johnstone & Boyle, 2018), much less is known about situated urban experience.

In sum: we suggest building on physiological data – skin conductance – to explore participants' embodied reactions to urban environment, in addition to more traditional qualitative methods, based on interviews and observation. But rather than focusing on these data as such, we aim through them to better understand the characteristics of the urban involved in arousal and stress. Having discussed so far what goes under 'bio' and respectively 'social' in our biosocial suggestion, what is left is to discuss the hyphen between the two.

3.2.8. Biosensory ethnographies

The combination of sensory ethnography, biosensing and interviews during which participants were asked to comment on cartographic visualization of their own EDA reactions – a method originally proposed by Nold 2018 – has been termed "biosensory ethnography" or "sensory bio-ethnography" by Çorlu and Yantaç (2016). While this procedure – has proven fruitful in eliciting narratives (Nold 2018), it also entails the risk of ascribing false meaning to the physiological data (Osborne & Jones, 2017, p. 161). To avoid such pitfall, Osborne and Jones, (2017, p. 161) further developed what

is in effect a biosensory ethnographic approach (although they do not use the term) within geography. They suggest combining: (i) biosensing to examine physiological arousal; (ii) narrative data through qualitative interviews to provide self-reported material on valence and causal triggers; and (iii) GPS and video recordings to provide spatial and environmental context. These three sets of data are combined in an analytical process based on triangulation, with variable entry points:

> The biosensing-led approach looks for points of fluctuation (i.e. arousal and deactivation) in the biosensing data which is then contextualized by examining the video/GPS and interview data to explore triggers and valence. The environment-led approach starts by examining the spatial and environmental context shown in the video/GPS data, looking for significant events or general trends and examining whether these environmental variations were reflected in the biosensing and interview datasets. The thematic-led approach starts with key themes discussed by participants, identifying and exploring whether and how these align with the video/GPS and biosensing data. (Osborne & Jones, 2017, pp. 162–163).

This procedure avoids forcing qualitative data onto physiological data and then only searching for a match between them. It leads to a consideration of moments when they differ, for instance by looking at what is not consciously registered but has nevertheless provoked a bodily reaction.

A biosensory ethnography is, in our view, an appropriate method to access situated sensory perceptions, and the three dimensions of urban experience — intersensory perception, the built environment and spatial transitions. First, tracking physiological arousal and narratives dynamically in situ during go-alongs enables the investigation of changes along the path, rather than just producing "static values for certain points of view" (Hijazi et al., 2016, p. 12), and at the same time, has the potential to enable the identification of discontinuities in spatial sequences (turning a corner, entering a building or a busy street, etc.) that elicit arousal and/or narratives. Second, GPS positions locate arousal spots and, for example, allow the characterization of participants' relations with the built environment through 'isovists', defined as the portion of space visible from a particular point of view (see Hijazi et al., 2016; Li et al., 2016). Finally, audiovisual recording combined with video-elicitation interviews constitute an efficient means to observe and discuss inter-sensory phenomena. The analytical process of triangulation provides the possibility for a balanced biosocial methodological approach to urban mental health where neither the 'bio' nor the 'social' is given analytical privilege. Physiological data allow the exploration of participants' affective relations to the urban environment with regard to largely unconscious, or at least 'less-than-fully-conscious' (Andrews et al., 2014) reactions. Even if EDA "cannot be seen as giving unfettered access to an individual's unexpressed emotional responses" (Osborne & Jones, 2017, p. 168), it can still provide an indicator that something vital is happening which can then be triangulated with a specific urban situation and a personal narrative.

3.2.9. Conclusion

Urban mental health constitutes one of those domains of research where the need for interdisciplinary collaborations on the elucidation of biosocial processes has appeared to be obvious for some years now.

It is testimony to a general epistemic context where “the life sciences, broadly conceived, are currently moving toward a more social view of biological processes, just as the social sciences are beginning to reincorporate notions of the biological body in their investigations” (Meloni et al., 2018, p. 1): a context, in other words, where new alliances between the life sciences and the social sciences are manifestly necessary (Rose, 2013).

This paper has explored the potential of biosensory ethnography as a biosocial method for a “re-vitalized” (Fitzgerald et al., 2016) approach to the study of the urban–psychosis nexus, and more broadly for the geography of mental health. We have developed four main arguments. First, we show that a focus on the bio in investigations regarding biosocial pathways in urban mental health prevails (in gene-environment interaction, epigenetics and neuroscience) and that it is necessary to develop more equally-balanced bio/social approaches. Second, focusing on the contact zone between what is traditionally understood as the biological and the social – the skin – we suggest magnifying and disaggregating situated sensory and affective relations to urban space. Third, our methodological proposal intends to push further recent in situ studies in psychiatry based on momentary assessment surveys in the city (Myin-Germeys et al., 2009). We propose the use of EDA measurement as a means of complementing ‘declarative methods’, i.e. methods in which consciousness and verbal expression are cardinal. The ‘declarative mode’ is present not only in this strand of psychiatric research but is also prevalent in standard interview-based qualitative research in the social sciences. Hence the need for a ‘vitalist stance’ and the development of experiments in “posthuman health geographies” (Andrews 2018). Fourth, in contrast to studies that infer emotional states from simple physiological data (Bergner et al., 2013; Hijazi et al., 2016; Zeile et al., 2009), we have argued for a contextualization and triangulation of these measurements with environmental and ethnographic data to produce a truly ecological interpretation of urban experience in mental health research.

The suggestion we make in this paper aims also to bring biosocial investigations out of the laboratory and into daily life situations. More precisely, it strives to get a better understanding of the intertwining roles of inter-sensory perception, the built environment and spatial transitions in urban mental health. Biosensory ethnography, in our understanding, is only one possible method in what we hope will become a burgeoning domain of radically interdisciplinary experimentation (Winz, 2018). Our suggestion or one fruitful direction for such experimentation is to focus on the skin as a biosocial contact zone, in order to explore how health is emplaced by continuously transgressing the boundary of the skin.

3.3. Research setting

While the previous chapter highlighted the need for a biosocial approach to the city/psychosis nexus and suggested a methodological orientation, here I provide more detailed information about the study the location, participants' profiles, as well as the rationale behind working on early phases of psychosis.

3.3.1. Basel

Basel, as the site of investigation, was chosen for different reasons, both practical and scientific. On a practical level, as a social scientist working for the first time in the context of mental disorders, gaining access to the 'field' was one of the first challenges in my research, and convincing psychiatrists and psychologists to collaborate on my project was crucial. Early detection and treatment services of psychosis emerged during the 1990s with the advent of new tools that enabled the identification of individuals at increased risk for psychosis, combined with the recognition that timely treatment in the early stages of psychosis considerably improves clinical and functional outcomes and prevents negative consequences. In Switzerland, there are four different Centres dedicated to the early treatment in psychosis: (i) Swiss Early Psychosis Project (SEPP), in Bern. (ii) Basel Early Psychosis Service (BEATS), in Basel. (iii) Programme de Traitement et Intervention Précoce dans les troubles Psychotiques (TIPP), in Lausanne. (iv) Zürcher Impulsprogramm zur nachhaltigen Entwicklung in der Psychiatrie (ZINEP), in Zürich. I managed to work in collaboration with the BEATS program in Basel. BEATS is a specialised mental health service at the University Psychiatric Clinics Basel, committed to the early detection and treatment of psychotic and other serious mental illnesses in young people. This program is the successor of the project FePsy (Früherkennung von Psychosen), a pioneering program in Switzerland devoted to early psychosis detection (which was carried out from 2000 to 2017). In Basel, I was fortunate to meet people who were interested in the subject, in my approach and who were willing to let me work with the patients in the program.[25].

Basel is the third largest city in Switzerland, after Zürich and Geneva, with an agglomeration of 550'000 permanent residents in 2019, spreading over three different countries, and about 175,000 inhabitants for the municipality. It is a medium-sized city, with densities varying considerably across neighbourhoods, ranging from 4000 to over 20'000 inhabitants per square kilometer, with an average of around 7'300 (OFS, 2021). The city is situated on the Rhine, which provides a direct access to the sea for the shipment of goods. Due to its geographical location in Northwestern Switzerland, and respectively Central Europe, it has a particularly important and privileged commercial significance for its region. It is the heart of an international economic area, between France, Germany and Switzerland which counts a total of approximatively 1.3 million inhabitants (Aldebert et al., 2021); around 34'000 persons cross the border every day to work in Basel (Kanton Basel-Stadt, n.d).

During the 20th century, the city has emerged as a world leading center for chemical and pharmaceutical industries: Global leaders in the life sciences – such as Novartis, Roche,

[25] Ethical aspects are discussed in a dedicated chapter (chap. 3.5).

Syngenta, Lonza – have their headquarters in the Basel region. This sector attracts (highly skilled) workers from all over the world; it is estimated that over 160 nations are represented in Basel and one person in two speaks more than one language (Kanton Basel-Stadt, n.d). In addition, the weight and financial power of these industrial groups is very important and participate largely in shaping and structuring the city's morphology, through various forms of public-private partnerships, and thus constitutes one of the main vectors of development of the city (Aldebert et al., 2021). A striking example of these dynamics are the towers built for the Roche headquarters by Herzog and De Meuron. The first, inaugurated in 2015 and measuring 178 meters high, was at that time the biggest building in Switzerland. A second tower is under construction, measuring 205 meters, while a third is planned for 2024 with a height of 220 meters. These complexes are new landmarks scattered around the outskirts of the old centre, and profoundly alter and mark the landscape of the city. These dynamics leads the city to advertise Basel as a small metropolis (Kanton Basel-Stadt, n.d). On this matter, Saskia Sassen, famous for her seminal work on 'global cities', answered two swiss journalist's question on her feelings about Basel while she was in town, in a telling way:

> Bangerter and Schuppli: You do research on big cities. What effect does Basel have on you?
>
> Saskia Sassen: Basel is full of history. This overwhelms visitors to the city. In addition, Basel – like so many European cities – has an enormously high level of diversity. Basel has a small core that is quite global. But the city doesn't seem like a typical 'global city'; it's far too pretty for that (laughs).
>
> (Bangerter and Schuppli, 2014, emphasis added, my own translation)

What does this answer by Saskia Sassen reveal? While characterized by these international and global dynamics, Basel remains a small city, with a peculiar and rather *cosy* landscape and urban life, in so far that it is in not comparable to metropoles such as Paris, London, New York or Shanghai. In 2019 Basel was ranked the tenth most livable city in the world by Mercer (Mercer, 2019) – where important criteria are safety, health care, education, hygiene, culture, political-economic stability, public transport and access to goods and services – and none of the above-mentioned metropoles were ranked higher.

The Rhine flows through Basel and cuts the city in two. On the left bank is the historic city with old houses made of stones and timber, dating from the 15th century, that are now home to small shops and boutiques, bakeries and restaurants. It is, for a great part, a pedestrian area. On the right bank, the Kleinbasel area is characterized by its more popular neighborhoods – all things considered - where a more contrasted population mixes. It is mainly made up of residential blocks and industrial buildings. The Roche Tower mentioned above are situated on this side of the Rhine, and contrast with an average height of the buildings that is rather low, especially in the old town. The districts to the south and east are residential, with single-family houses and green spaces. While Basel is not a 'sleepy city', it may still be characterized by a rather relaxed and friendly atmosphere, with streets filling up at the end of the working day and the many terraces hosting people for an afterwork refreshment. In summer, the river banks of the Rhine in Kleinbasel become very animated; swimming in the Rhine is a beloved summer activity; people pack their clothes in a waterproof bag and let the current carry them through the scenery of the old town situated on the left and the crowded riverbanks on the right.

For practical reason, the historic left river bank of the city was the area in which the urban walks took place for the purpose of the study. This has to do with the fact that we started the walks at the University Psychiatric Clinics' ambulatory service, situated right at the fringes of the city centre. As walks were on average 45 minutes long, we could not reach the 'Kleinbasel' area situated west, on the other side of the Rhine. Our walk took us along the old city walls, along a heavily frequented road that circumvents the city centre. This led us through the botanical garden, before descending to the Rhine on another important road. Once we reached the Rhine, we took a footpath along the river (Drei-Könige-Weglein), and then arrived at the 'Schifflände' crossroads, considered by many to be one of the entry points to the city. The city comes more alive from this point onwards, with a much higher presence of people, but also of means of transportation such as trams and bicycles. Bicycles and trams are an important part of the city; many people travel with these means, while access to the city centre with a car is limited. Along the way, we cross the large market square (Marktplatz), with its cobblestones and bordered by the richly decorated red sandstone town hall. A major tram line runs along one side of the square. Following this line, we then walk through a pedestrian zone, heading to one of the busiest places in the city centre, the Barfüsser place, which is a major public transport hub. The next part of our journey took us to the cathedral, through a busy shopping street, especially at night, and through small and animated alleys, to arrive at the Münsterplatz, which is home to another historic landmark of the city, the late Romanesque-Gothic cathedral. Behind the Cathedral, the Münsterplatz offers an esplanade overlooking the Rhine. From that point, participants where free to choose the way back to our starting point.

3.3.2. Sampling rationale and recruitment

Psychosis affects mostly young persons, especially in their late teens and twenties, with a majority having their first episode by the age of 35 (Kirkbride et al., 2006). As discussed previously, stress is a plausible mechanism underlying the association of urban environments and psychosis. Moreover, it has been suggested that, "[s]tressful events may be more relevant for the onset of psychosis than for relapse in schizophrenia patients, similar to what has been found in major depression" (Corcoran et al., 2003, p. 680). In addition to stressful life events, "there are more subtle everyday factors that might be associated with illness, such as daily stressors or hassles" (Corcoran et al., 2003, p. 680). As a consequence, it is crucial to identify the small stressors of daily urban life, to locate stress and arousal locations within cities, and explore relevant urban factors (social and geographical) implicated in the experiences of stress in people with early psychosis. Thus, it is important to work with participants in this age cohort.

As discussed previously, stress is thought to be a plausible hypothesis linking urban environment or urban living with psychosis. While it is recognised that certain socio-environmental factors (such as urbanicity, but also ethnic minority status) are associated with psychosis (Van Os et al., 2010, Morgan et al., 2010), the underlying mechanisms remain elusive, and 'the psychological mechanisms underlying an individuals' subjective experience of these factors in daily life are poorly understood'(Reinighaus et al., 2016, p. 713). Elevated sensitivity to stress, "characterized by intense emotional reactions to minor stressors and routine daily hassles" (Reinighaus et al., 2016, p. 713), is one of the most prominent mechanism being

currently investigated, and it is a line of thought that may explaine the link between urban living and psychosis:

> "Some individuals may experience stronger emotional reactions to unpleasant neighbourhoods and, thereby, develop more intense psychotic experiences" (Reinighaus et al., 2016, p. 713).

There is evidence suggesting that emotional reactivity to minor stressful events, social situations and activities is higher in persons living with psychosis (Oorschot et al., 2009; Myin-Germey & Van Os, 2007) and in persons with an at-risk mental state (Palmier-Claus et al., 2012). In addition, stronger psychotic experiences have been found to be associated with elevated sensitivity to minor stressful events in FEP individuals (Reinighaus, 2016).

Building on these findings, the present research includes FEP and ARMS individuals, as well as a control group. The main focus of the study is to refine our understanding of 'urban stress' for persons living with early psychosis and persons with an at-risk mental state for psychosis, and potential differences between these groups. The study includes a control group, which is meant to help identify or highlight potential specific stress spots and/or relevant urban social and geographical factors that elicit emotional reactivity for persons with early psychosis and/or persons with an at-risk mental state for psychosis,

In Basel, Barbara Bailey and Jennifer Küster, who are currently in charge of the BEATS program, made resources available to help recruit participants, which allowed me to work with young persons (18-35 years old) having experienced a first episode of psychosis and persons with an at-risk mental state for psychosis, two target demographics for the purposes of my study.

Therefore, I worked with two different participant profiles recruited within the BEATS program: (i) persons having experienced a First Episode of Psychosis (FEP) and (ii) persons with an at-risk mental state for psychosis (ARMS)., identified as such within the BEATS program according to established criteria (Andreou et al., 2019). All participants were between the ages of 18 and 35 years old, fluent in German or French and gave their informed consent on a document approved by the local ethics committee. Participants recruited within the BEATS program met either of the following criteria:

> a) First Episode Psychosis (FEP), defined as having received a first diagnosis of a psychiatric disorder less than 2 years prior to study participation, and presence of psychotic symptoms in any form for less than five years.
>
> b) At-Risk Mental State (ARMS), defined as presence of attenuated positive symptoms or brief, limited and intermittent psychotic symptoms, as assessed with the Structured Interview for Prodromal Syndromes and the Scale of Prodromal Symptoms (Miller et al., 2003).

Exclusion criteria included (i) severe hostility, suspiciousness or formal thought disorder as determined by the BEATS team, (ii) persons whose active participation in the study was considered at risk of major decompensation by the BEATS team and (iii) lack of informed consent. Screening and classification as FEP or ARMS took place in the BEATS program prior to the study.

Recruitment of the participants within the BEATS program was carried out in collaboration with members of the program. Master Students and members of the secretary team of the BEATS program contacted all the patients meeting the inclusion criteria between September 2019 and February 2020. Using a flyer and an information letter as a recruitment tool, they explained the aim and design of my study to potential participants, and asked them if they were interested in participating, and if they agreed to be contacted by me. A total of 23 participants expressed their interest in participating. I contacted each person by email and/or telephone for further information and explanations, in order to set up a first meeting. Out of the 23 participants, 5 could not be reached and 8 declined for various personal reasons. The remaining 10 participants were invited for a first meeting. Prior to the meeting, these participants received detailed written information[26] (see Appendix A). During the meeting, I explained the purpose and design of the study as well as the rights of the participants and answered any question on participation in the study. At the end of the meeting, the participants were asked to give written informed consent to the research protocol that was approved by the local Swiss Ethics Committee. Out of the 10 participants invited for a meeting, one declined to sign the informed consent document after the recruitment interview. Hence 5 FEP and 4 ARMS persons participated in the study. At the end of the interview, an appointment was scheduled for fieldwork. In addition, I included a small control group of four participants.

Inclusion criteria for the control group included (i) absence of psychotic or prodromal symptoms, (ii) lack of antipsychotic treatment at the time of the study or in the past, and (iii) no family history (first degree) of disorders involving psychotic symptoms (schizophrenia, schizoaffective disorder, schizotypic personality), major mood disorder (recurrent depression or bipolar disorder). Exclusion criteria included (i) lack of informed consent (ii) any past or current psychiatric disorder (including substance use disorders), (iii) history of schizophrenia or bipolar disorder in a first-degree relative, (iv) history of cranio-cerebral trauma, neurological disorders, or serious medical disorders that may affect participation in the study. The recruitment of the control group was carried out by using a flyer, and through personal networks and snowball sampling methods. The recruitment interview followed the same procedure as with the persons recruited within the BEATS program, except that the control group performed a brief screening interview, to assess inclusion and exclusion criteria.

Participation in the study was compensated to the amount of 40 swiss francs per participant, in accordance with the usual practice of the BEATS program and with the Swiss Association of Research Ethics Committees (SwissEthics) guide on the monetary contributions to patients participating in research projects. In the next chapter, I present the study procedure that was followed in the data collection.

[26] All written documents handed to the participants were approved in advance by the local ethics committee. This aspect is discussed more thoroughly in chapter 3.5

3.3.3. Participants

FEP participants were between 20 and 32 years old, ARMS between 22 and 26 and controls 22 and 31. In the control and ARMS group, half of the participants were men and half women. The FEP groups included 2 men and 3 women. The catchment area for the recruitment is the agglomeration of Basel. The idea behind the definition of this area for recruitment it was that I intended to recruit participants that had a knowledge of or were familiar with the city. This was important, due to the fact that the protocol included a section of the path to follow that would be decided by them, in order to get back to the starting point. Moreover, recruiting persons familiar with the urban environment in which the study took place was a means to minimize potential risks with regard to ethical issues and a means to lower potential biases related to feelings of stress or unease that would emerge because they find themselves in a new environment.

All participants were familiar with the study site to some extent, because they either work or had worked in Basel, or because they went to school or studied at the University in the city, and most lived in the city. As a matter of fact, all participants except three, had their place of residence in the canton of Basel-City, which is composed of three municipalities located at centre of the Basel agglomeration. Two participants lived in Basel-Land, which is the canton that surrounds Basel-City and the third was established in Germany, not far from the boarder he crosses usually on bike to come the university where he studies. One of the FEP participant decided to leave the city centre and to establish herself in the outskirts, so that she could have a bit of both; access to the city, and the more restful environment of her living environment. This was above all a decision linked to her personal life and not to her mental health, although she said that it was a well-timed decision for her. On the other, one of the ARMS participants defined himself as a city person, and said that, in general, he needed the animation of a city, although this depended on his fluctuating state of mind. This participant was born and had lived in Mexico City for a few years, before he came to Switzerland as a child. Currently living with his parents outside the city, he takes every opportunity he has, as he says, to grab his skateboard and cruise through Basel. The skateboard is his favourite means of transport, giving him as sense of freedom, as he says, using the city as his playground.

As previously mentioned, about half of the participants were students or had been studying at some point, either in Basel or in other cities in Switzerland, like Zürich. This led some of them to take a particular look at my own research, asking questions about the research protocol, willing to know if the fact that they knew the city was not a potential bias, and more generally about the broader connections between urban geography and mental health questions and the way I, as a geographer, came to be interested in the topic. Those who weren’t studying had jobs in various areas, such as in public administration (Boarder offices, hospitals), private companies and retail stores. One of the FEP participants had just begun a new job, after having interrupted his studies and after a long time of unemployment. This was obviously a big relief for him, and changed also massively his relation to the city. While passing by the University, he expressed the mixed-feeling he associated with this area. It was, for some time, he said a place where he attended fascinating and exciting lectures and had a social life that fulfilled him. But it also reminded him of very difficult moments of his life, related to his mental health, and the fact that

he had to abandon his studies. Moreover, the city, while being unemployed, was a constant reminder, he said, of his own status. Seeing all the people with their suitcases, badges and so on, he kept thinking that all these people go to work, and that he was not. One of the participants is an emerging contemporary artist, with whom we had plans to collaborate for illustrating my doctoral dissertation. Unfortunately, this project did not come to fruition.

3.4. Study procedure

This chapter describes the procedure that was implemented, according to the course of a day during which the data was collected, as well as it discusses relevant methodological aspects for each step of the process.

After the recruitment interview, on the day of participation, I welcomed the participants at the psychiatry health centre at Kornhausgasse 7, which is one of two contact points at the UPK Basel. After welcoming the participants, I made sure that they still wanted to participate and asked if they had any questions about the study. For the purpose of the study, participants were asked to walk in the city of Basel, while wearing a non-intrusive biosensor (*Empatica E4* bracelet) that measures skin conductance[27]. The Empatica E4 wristband is a wearable wireless device designed for comfortable, continuous, real-time data acquisition in daily life. The E4 is a medical-grade wearable device designed for research[28]. It is used for collecting physiological data relevant to healthcare. Areas of interest include pain, sleep, stress, arousal and infection research. The E4 monitors four different variables: (i) Photoplethysmography (PPG) to provide blood volume pulse, from which heart rate, heart rate variability, and other cardiovascular features may be derived; (ii) Electrodermal activity (EDA), used to measure sympathetic nervous system arousal and to derive features related to stress, engagement, and excitement; (iii) 3-axis accelerometer, to capture motion-based activity; and (iv) infrared thermopile, reading skin temperature. In the present study, we focus on electrodermal activity, for the reasons and purposes discussed in chapter 3.2. During the walk they were asked to describe the surrounding environment and share their feelings with me during a mobile interview.

Before going out for the walk, I asked the participants to wear the *Empatica E4 bracelet.* Participants were then asked to rest for 15 minutes, with the instruction to relax, while doing nothing (I asked them specifically not to read or handle their smartphone). This procedure is recommended by the manufacturer, in order to make sure that the electrodes establish proper contact with the skin. While we observed this period strictly, the electrodes failed to make proper contact in three participants. This produced corrupt skin conductance data for the first twenty to thirty minutes of the walk. Since this observation could only be made after completion of the walks, and due to the limited number of participants, I asked these participants if they agreed to set up a second walk. All three participants agreed.

[27] Details on skin conductance are discussed in section 3.6.3 and sect. 4.2.5
[28] The E4 wristband is a class IIa Medical Device in the European Union, according to CE Cert.

After this first step, we left for the walk. I accompanied the participants during the walk, in order to conduct a mobile interview. Here, I draw on the "commented city walks" (Thibaud, 2013), a method developed by French urban sociologists to study participants' experiences of urban environments. This method relies on the intertwinement of three simultaneously achieved activities; walking, perceiving and describing (Thibaud, 2013). Essentially, "this experience involves taking a walk and describing what is perceived and felt during the excursion" (Thibaud, 2013). As such, the method foregrounds (i) perception in context, (ii) perception in movement and (iii) the interlacing of perception and description. The method aims to point at and build upon the "situationally-rooted nature of perception in order to develop an *in situ* approach" (Thibaud, 2013, p.3). Following this approach, the investigation site is established ahead of time but the route is left to the decisions of the participants. The researcher is supposed to intervene as little as possible, mainly listening to and recording the description given by the participant. This is where my approach deviates from the original method as described by Thibaud (2013). The way I put the method into practice was a little less open, as I oriented the discourse of the participants towards the three research axes that underpinned my study. This was done in two ways. Before we left, I gave some instructions to the participants, asking them to comment and describe the environment with regard to sensory perception, spatial transitions and the built environment, as well as to share their feelings (instructions are available in Appendix B). I asked them to focus on the moment throughout the walk, but I also let them know that they could also convey memories from different times if they wanted. In addition, during the walk, I reoriented the discussion to these themes, when we drifted to far away from the subject (interview guides are available in Appendix B).

I predetermined the path for the first part of the walk, while the return was left up to the decisions of the participants. The rationale behind this was that the imposed part would provide a common basis for comparison between participants. Here I decided to set a path that included variegated urban environments: parks, busy roads, squares, pedestrian areas, less busy roads, etc. The reason behind letting the participants decide the path to follow on our way back was to identify potential locations that they avoid. Once the walk was completed, I conducted a short debriefing interview. This semi-structured interview was dedicated to look back at the walk, allowing participants to express their general impressions and feelings *a posteriori* (the interview guide is presented in Appendix C). After this interview, the participants took the 'current Cape-15' questionnaire, that assesses symptoms of distress[29].

During the walk, I wore a chest-camera that I used to record the discussion and to film the urban environment. This was meant to produce a visual document and a rich sense of context, which could then be used later for analysis[30]. In addition, I used a GPS to track the route. This allowed me to geocode the skin conductance data (this is explained in more detail in sect. 4.2.5).

[29] This is discussed in more detail in section 4.2.5

[30] The analytical procedure that I implemented is presented in chapter 4.2.5.

The following figure provides a summary table of the study phases:

Study phases	Recruitment interview	Fieldwork (walk + debriefings interview)	
Duration	45 min.	60 min.	30 min.
General information and informed consent	X		
Inclusion/exclusion criteria check	X		
Walk-along interviews		X	
Skin conductance monitoring (during the walks) + gps tracking.		X	
Video-recording of the urban environment		X	
Current-cape 15 questionnaire			X
Debrief interview			X

3.5. Ethical Aspects

In the following, I look at some critical ethical issues with regard to my study process and the corresponding measures I implemented. Here the discussion is limited to the ethical approval process, and its impact on the study design presented in the previous chapters; I discuss further ethical implications in the next chapter (3.6) and in the general conclusion of the dissertation (part 5).

In 2014, Switzerland adopted the 'Federal Act on Research Involving Human Beings', also called Human Research Act (HRA) (Federal assembly of the Swiss Confederation, 2011)[31]. The HRA which specifies the legal regulations governing research involving human subjects, and the ethics committees, which are responsible for the thorough assessment and approval of all health-related research projects on humans before they start" (Coordination Office for Human Research, 2016, p. 2). The objective is to protect the participants dignity and psychological integrity, as well as to guaranty the safe handling of personal health-related data in the context of research. My doctoral research, involving persons diagnosed with a first episode of psychosis (FEP) and persons with an at-risk mental state (ARMS), falls under the scope of the HRA, and thus required approval from a competent ethics committee[32].

The HRA includes the Ordinance on Clinical Trials in Human Research (ClinO) and the Ordinance on Human Research with the Exception of Clinical Trials (HRO) (Swiss Federal

[31] The text has been approved by the Federal Assembly in 2011, on September 30 and came into force in 2014, January 1st.

[32] University ethics committees are not competent to rule on a project that falls under the HRO Act.

council, 2014). The latter governs research studies that are not classified as clinical trials, but involve the collection of health-related data and research on biological material. Differentiating between these two categories is not always straightforward, and it appeared that my project could in fact be interpreted from both the ClinO and the HRO perspectives. However, after discussion with the university ethics committee which helped, I opted to submit the request under the HRO model, since my project does not aim at directly trying to validate a process, a device or a drug, but remains more observational. My project was approved by the 'Ethikkommission Nordwest- und Zentralschweiz' (EKNZ) on July 15, 2019 (project-ID 2019-00953, see appendix D), after revision of a first submission. Recruitment started after approval was granted.

Risk-benefit assessment is a fundamental criterion in the evaluation by the ethics committee. The notion of 'vulnerability' is crucial here, since the HRA prescribes specific measures for 'particularly vulnerable persons'. This includes children, adolescents and adults lacking capacity, pregnant women, embryos and in vivo foetuses, as well as prisoners. My study does not involve 'particularly vulnerable persons, as defined by the Human research Act (HRA art. 21 - 28). Although the health risks associated with participation in the study remain minimal, given the methods used, particular attention was paid to preserving the psychological stability of participants. Thus, inclusion was conditional on the favourable opinion of the usual care team who weighed the risks and benefits of participating in the study, to ensure that the study is not experienced as intrusive or as causing a strong reaction, and to avoid that it compromises the patient's psychological stability. Their participation in the study did not require any modification of existing therapeutic measures. Patients were informed that they were free to enter or withdraw from the study at any time, without having to justify their decision and without any consequences for their medical treatment. All walks could be interrupted or readjusted at any time, according to the patient's rhythm and at her/his request. In addition, if the participant wished, a third person of his acquaintance accompanied us for the course. Finally, the care staff from the BEATS program was reachable by phone during the walks, if needed.

Data-management and confidentiality is another important aspect. The collected data is handled with uttermost discretion; only the personnel from the BEATS program and I had access to the indispensable personal information needed for the study. The stored data is coded; each patient has been assigned an identification number or code. The code is kept on a secured server separate from the data, and only I have direct access to it. For further processing of the data, participants are only identified with the unique participant number. Stored data is limited to essential private data, and overall, complete confidentiality of data and patient identity will be ensured in full respect of the participants' privacy. With regard to physiological data, *Empatica* does not handle any personal information linked to physiological data on its servers; the data is organised by sessions that have a start time and duration. The data housed by Empatica cannot be matched with the individuals physically wearing the device. Empatica is not able to access personal data from the study participants, since the account is associated with the researcher, not end users. This data is effectively anonymous. According to the manufacturer, Empatica is fully compliant with the General Data Protection Regulation (GDPR) of the European Union.

The data collected within this project can be used only for the purpose of this study. In accordance with the requirements by the ethics committee, the data collected for the study will be anonymized after completion of the PhD, and stored on the secured server at the University of Neuchâtel for 15 years, for potential reuse in further studies. An agreement to reuse the data for other, yet undefined research projects, has been formalised by a separate consent form. Participants retain their right to revoke their consent at any time. In addition to the detailed research protocol and the informed consent form, all written documents used for the study – such as the flyers and information letter for recruitment, interview guides, screening questionnaires – have been examined by the ethics committee.

3.6. Methodological Bricolage

As stated throughout the dissertation, my research is situated at the intersection of health geography and psychiatry and strives to explore unknown terrain. The approach I developed is an attempt to cross-fertilise biosensing research on urban stress and emotion with Mhealth in mental health research. As such, it is an attempt to respond to the call within the social sciences to (re)kindle collaborative partnerships with the life sciences, embrace this alliance and develop novel modes of investigation. In the following, I frame my methodological approach as one that is inspired by and tends towards a *bricolage* approach. I then examine some of the challenges I encountered in my interdisciplinary *bricolage* design and examine nodal points where adjustments were made over the course of the study. More generally, I discuss some of the issues I faced in the arrangement and alignment of elements and procedures stemming from psychiatry, physiology (skin conductance) and qualitative research. In so doing, I shed light on the way my research process unfolded, putting into perspective my own position as a researcher.

3.6.1. Bricolage as a mode of research

Bricolage is a French word that refers to amateurish and unplanned manual work, not executed with the precision of a professional and/or work that is improvised and adapted to the materials at hand. *Bricolage*, is translated into 'to tinker' or 'make do' in English, but I stick to the French word, since it's the one often used to describe a research process that resonates with my pathway. *Bricoleur* is the term used to describe the person that produces a *bricolage.* Lévi-Strauss is often cited as the first scholar to have imported the notion of *bricolage* into academic debates. He used the concept in *The Savage Mind* to describe a specific mode of acquiring knowledge, referring to *bricolage as* "a spontaneous creative act that uses whatever is available to reach a desired outcome" (Yee & Bremner, 2011, p. 2). While Lévi-Strauss used the concept to describe something he observed, Denzin thinks of *bricolage* as a research practice, due to the multitude of methodologies that exist in qualitative research. In this respect, the researcher becomes a *bricoleur,* according to Denzin:

> The qualitative-researcher-as-*bricoleur* uses the tools of his or her methodological trade, deploying whatever strategies, methods, or empirical material that are at hand (Becker, 1989). If new tools have to be invented or pieced together, the researcher will do this. The choice of which tools to use, which research practice to employ is not set in advance. The 'choice of research practices depends upon the questions that are asked, and the questions

> depend on their context' (Nelson, Triechler & Grossberg, 1992, p. 2), what is available in the context, and what the researcher can do in that setting. (Denzin, 1994, p.17)

Kincheloe further conceptualised *bricolage* as a form of research that employs methods and concepts from various disciplines (2011). Here, "[i]nterdisciplinarity in *bricolage* is based on dialogue, on an interrelationship between knowledge and disciplines, in order to promote an integrated, contextualized research with related knowledge" (Campos & Ribiero, 2018, p. 5). Thus, *bricolage* is a form of research, where one does not 'simply' use existing, established and widely accepted methods or methodologies, but rather challenges the limits of these standardised approaches. One elaborates a research praxis according to the research problem, as the research process unravels, according to the opportunities, collaborations, technical possibilities that present themselves.

3.6.2. Bricolage, ethics and psychiatry

Ethical considerations revealed some of the difficulties when working in between fields from which I am partly estranged. As mentioned in the previous section, my research protocol had to be approved by the local ethics committee because the research I intended to conduct falls under the HRA. Fulfilling the requirements to conduct research with persons diagnosed with a psychiatric disorder was not straightforward, given that I had no prior research experience in this field.

Two interrelated notions were central in the *bricolage* of a meaningful and ethical study procedure, namely, (i) vulnerability and (ii) risk. These two notions are crucial in the elaboration of a research protocol that can be approved by the local ethics committee. They also refer to questions that were not easy for me to evaluate, not having any training in psychology or psychiatry. What is vulnerability in the context of my research? How can I account for it? The HRA is specific on this aspect: it describes specific measures to be taken when working with "particularly vulnerable persons", and it specifies what is understood by "vulnerable persons", i.e., children, adolescents, adults incapable of discernment, pregnant women, embryos, foetuses (in vivo) and prisoners. In other words, people having experienced a first episode psychosis and persons with increased risk for psychosis are not considered as vulnerable in the sense of the HRA. More generally, people with mental disorders are not identified as 'vulnerable persons'. However, it appeared to me that such persons should be considered vulnerable, at least partly, and that specific measures should be taken in order to guarantee their wellbeing. This is due to the fact that the fundamental hypothesis of my research relates to the fact that certain elements of urban environments may represent a source of stress, which in turn can contribute to the emergence of psychosis. Since the study design consists in taking FEP and ARMS persons on a walk through such environments, it would be insincere and unserious for me to ignore the potential vulnerability of my research participants.

I was confronted with similar questions when considering the issue of risk; what are the risks involved in my research? How can I quantify risk within my study? Here again, the HRA defines two categories of risk (A or B), and the risk categorisation defines the procedure to be followed. Risk category A applies if the planned study entails 'only minimal risks and burdens' and category B when these risks are 'more than minimal' (Swiss Federal Council, 2011). Risk category B implicates very strict conditions, as well as administrative consequences, such as

contracting a specific insurance to cover potential costs. Since the HRA is a legal text and I am not trained in law, I was confronted with the limits of my ability to make clear sense of its implications. I sought support at the internal ethics committee of the University of Neuchâtel and it appeared that my protocol could be considered as falling in either categories. Arguments by the University ethics committee for this were the following: a priori, the participants will not be subjected to any different stimuli than those they already face when they move around the city anyway. This would therefore correspond to an A level. However, since the walk is made for research purposes, it is difficult to say that this remains a usual risk (i.e. risk category A): the protocol involves the observation of potential stressful moments. Hence, it is not impossible that the participants may find themselves overwhelmed, or in a situation of decompensation. In this case, category B risk level should be considered.

The submission of an ethical approval under either the ClinO or the HRO, as well as the risk categorisation all impact the procedures to follow and measures to take to be able to carry out the research. On the matters of vulnerability and risk, adapted solutions were inspired by the discussion with the University ethics committee and discussed with specialists from the BEATS team. I chose to submit the application the competent ethics committee under the HRO ordinance, with a risk category A. Among the various measures to limit and manage risk, I foresaw in the protocol that the participants would be accompanied by a person of their choice, as a reassuring person, during our walks. This preventive measure I included in the protocol, turned out to be excessive, as a majority of the FEP and ARMS participant insisted on coming alone. My impression is that this measure was more stigmatising than helpful for them. Hence, I adapted the study protocol accordingly. Retrospectively, I feel that a lot of my effort and argumentation of classification and risk categorisation, went into avoiding too severe constraints, that could jeopardise the possibility to go on with my research in a timely manner, or even to carry out the research at all. However, I am convinced that my project is appropriately classified (and I think I wouldn't have been granted authorisation by the ethics committee if this was not the case), but I think there might be some friction between classification, risk assessment and the (time) constraints and resources placed on doctoral students to complete their research projects.

3.6.3. Working with physiological data

Historically research on EDA has been done in labs. In this context, Lykken and Venables developed the standardized techniques of recording skin conductance and standardized units of measurement (Dawson et al. 2000: 201). However, technological progress made available non-invasive ambulatory devices. For practical reasons - due to the fact that these measures are now possible on a long term (from a few minutes to several weeks) and in everyday life situations (involving various activities), ambulatory measurements differ from the standard measurement techniques elaborated in labs. Comparative studies established the validity of ambulatory measures compared to standard measurements, and a recently growing number of "studies have demonstrated that the ambulatory measurement can guide provide (*sic*) essential aspects for understanding emotions in real-time and real-world setting" (Kim & Fesenmaier, 2014, p. 285).

Skin conductance includes two main components resulting from the sympathetic neuronal activity (Braithwaite *et al*., 2013, p. 3-4): "One component is the general tonic-level EDA which

relates to the slower acting components and background characteristics of the signal (the overall level, slow climbing, slow declinations over time)” (Braithwaite *et al*. 2013: 4), and is referred to as Skin conductance level (SCL) (Boucsein, 2012; Dawson, 2000; Braithwaite et al., 2013). The other component “is the phasic component and this refers to the faster changing elements of the signal - the Skin Conductance Response” *(SCR)* (Braithwaite *et al*. 2013: 4). Those short-changing phasic reactions are superimposed on the slow evolving tonic electrodermal level (Dawson, 2000, p. 201). Generally speaking, two components are of interest when it comes to map emotional responses to (urban) environment, in real-life real-world context: “the aspects of EDA usually taken to index arousal are the tonic SC level (SCL) and the frequency of SCRs without regard to specific stimuli” (Zahn et al., 1991, p. 186). In the context of ambulatory research, it is recommended to use skin conductance level (SCL) (The Society for Psychophysiological Research Ad Hoc Committee on Electrodermal Measures, 2012). I followed this recommendation. As a result, skin conductance data needed to be separated into its tonic and phasic parts for interpretation. However, skin conductance monitored in ambulatory setting tends to be noisier that measurements done in laboratories. Thus, the data measured in real-life context needs to be pre-processed, to remove potential movement artefacts, before further use. This is where bricolage emerged in my research with regard to skin conductance data.

Commercially available devices of ambulatory physiological monitoring raised the possibility for me to integrate such novel methods. However, I was not familiar with physiological measurements and data. Thus, it was necessary for me to get acquainted with the relevant literature and an unfamiliar field of research, in order to identify lines of investigation and coherent procedures for the treatment and analysis of these data. The fact that I was working with newly released tools created some practical obstacles for me. Because ambulatory physiological data collection is a relatively new field, there is no 'golden standard' for data collection and processing, and practices vary considerably among the existing literature (Posada-Quintero et al., 2020). One must therefore deal with existing practices, evaluate their advantages and limitations, and then establish one's own protocol. I was fortunate here to have been able to find support from researchers at the school of Engineering at Haute École Arc Neuchâtel (He-Arc), who accepted to collaborate with me on their own funds, in order to search for a data processing solution. While it was tempting to use skin conductance data in its raw form, I refused to do so. Instead, we explored the subtleties of this data, in order to elaborate a data processing pipeline that made sense, both from a theoretical and practical point of view. This was reached after several months of exchanges, discussions and tests with the researchers at He-Arc. Retrospectively, I think there was a desire on my part to overcompensate for the lack of previous research experience with these physiological measures, which is linked to the *bricolage* I was elaborating. I could have been satisfied with less extensive data processing, as is the case for some studies that have worked with these tools. Nevertheless, for the sake of legitimacy, I persisted in developing a more extensive data processing procedure that considers the intricacies and complexities of the data to some extent. In order to build a robust approach, I felt that we could not remain on the surface, but had to propose an approach that respects fundamental codes that prevail in the field from which I 'borrowed' a technique. In the end, the procedure we developed is a unique approach, set up by trial and error, between practical tests

and the examination of the theoretical and empirical corpus of studies that have used similar tools.

Data treatment has also been adjusted after the fieldwork, when elaborating the skin conductance maps in collaboration with the cartographer André Ourednik. As per the study procedure and the manufacturer's recommendation, I asked participants to rest for 15 minutes while wearing the Empatica E4 bracelet before we left for the walk. In addition to ensuring that the electrodes are connected properly to the skin, this resting period should also provide a baseline skin conductance value that could be used afterwards during analysis, if the participants were truly relaxed. This was not the case, since skin conductance values for several participants did not drop to low levels. This can be explained by the fact that the situation remains somewhat not relaxing *per se*, or by the fact that some participants did not observe the instruction to rest while doing nothing (I explicitly asked participants to not use their smartphone during this period, which was not systematically achieved). Hence, in order to be able to create the skin conductance maps I used for analysis, we had to readapt the data treatment.

The collaborations reported here were not established beforehand; they were built up as the research evolved, according to the tools I was able to access and according to the issues I encountered. Each of these steps subsequently guided the ways in which the data processing was articulated, which ultimately impacted how the research was conducted.

3.6.4. Ethnographic bricolage

From the point of view of qualitative methods and ethnography, working with the participants *in situ* was one of the premises of my empirical approach. However, as the research project developed towards integrating physiological measures, the study design evolved accordingly. As such, my research assumes a peculiar stance, one that employs qualitative and ethnographic aspects, but it is set up as an 'experiment', more anchored within psychological, psychiatric or clinical research. The fieldwork took place during walks in the city, in an ordinary daily-life context. However, the procedure put in place before and after is far from a mundane routine since it entails very formal aspects, such as the recruitment interview and the thorough informed consent procedure. Moreover, the study began and ended at the ambulatory psychiatric service in Basel. While most participants associate good memories with this place because they found help there, this location is not neutral and does not come without any emotional charge. The walk itself was also not free from artifacts; I wore a chest camera, which is visible to others, and the participants wore a small microphone. Before we left, I had to calibrate the GPS, verify that the Empatica E4 was set up accurately and synchronise the video with the bracelet. In my opinion, all these little gestures participate in creating a situation that is more of a 'close-to real-life' situation and still an experimental setup, rather than being truly representative of ordinary daily life.

Zooming out to the broader context, the Covid-19 pandemic created unique research conditions to deal with. My fieldwork took place in Autumn 2020. As such, it took place in between the two first lockdowns that were implemented in Switzerland. These measures affected how I was able organise the collection of the data. The first lockdown, in the Spring of 2020, prevented

me from conducting the empirical part of my research, initially planned at that time. It also hampered my ability to plan the fieldwork, since there were too many unknown and unforeseeable parameters. As a consequence, I waited before contacting any potential participants, since I did not want to establish the first contact without being able to follow up with the recruitment interview. Thus, I waited for the right opportunity until the end of the summer, and started recruitment in September 2020. Soon afterwards, in October, the numbers of Covid-19 cases started to increase in an unprecedented manner in Switzerland. In the middle of this 'second wave', I had the feeling that I needed to complete the fieldwork before a second lockdown. I focused first on the participants from the BEATS program, and then finished with the control group. It was a bit of a 'now or never' atmosphere. As a consequence, the rhythm of the recruitment interviews and of the data collection sessions did leave only limited room for a self-critical distance and time for evaluation. Nevertheless, some short time adaptations were devised in response to the various difficulties I encountered.

3.7. Conclusion

The methodological framework aimed a presenting the methods and procedure implemented in my study, as well as to discuss the rationale behind them. Adopting a biosocial approach, my doctoral research project aims to better understand where and why people with early psychosis and persons with an at-risk mental state for psychosis experience discomfort, arousal or stress in cities. For that purpose, I created an innovative and experimental research protocol, situated between the controlled laboratory and unpredictable real-life situations. To do so, I combined (i) ambulatory bio-sensing to examine physiological arousal; (ii) narrative data collected through qualitative walk-along interviews, used to access participants' interpretations of their relationship to urban situations; and (iii) environmental data, collected through GPS and video recording, used to provide a rich sense of urban context. In addition, I borrowed elements from psychiatry, such as the Current CAPE-15 questionnaire, and I elaborated a research protocol that followed the field's ethical guidelines. Beyond the identification of relevant social and material characteristics of the urban environment and how they relate to stress and arousal in persons living with early psychosis and persons with an at-risk mental state for psychosis, my approach tests the productive potential of an unconventional biosocial *in situ* approach to urban mental health questions. Methodology is therefore an integral part of the research process I developed and implemented, and can be seen as a scientific contribution in itself.

Such an endeavour, however, does not come without hitches. This is why I frame my approach as one of *bricolage. Bricolage* is sometimes associated with the absence of a 'plan', and one of the main criticism addressed to *bricolage* is a potential lack of rigor, sometimes derided "as an 'anything goes' methodology, and with this, there are scientists who do not 'see it as a rigorous way of doing social research'" (Campos & Ribiero, 2018, p. 5). However, the "*bricoleur* researcher is not naïve" (Campos & Ribiero, 2018, p. 5), and *bricolage* as a research praxis does not necessarily lack scientific or methodological rigor. Rather I understand it as a mode of research that is dynamic and not static, where bricks are brought together successively and solutions have to be elaborated over the course of the research for a final output that is not given

in advance. In the discussion above, I have highlighted some of the difficulties of my research process that are due to my interdisciplinary *bricolage,* and I detailed my adjustments to the social context and to the obstacles I encountered. The doctoral research presented here is the fruit of these arrangements and negotiations. The next part presents the results that arose from the procedure I implemented, by means of the third article.

4. Analysis and Results

4.1. Introduction

In this fourth part of the dissertation, I move on to the primary empirical component of my research. I present the results of my study and discuss their implications. I frame my study as a first attempt to cross-fertilize two recent and closely connected but nevertheless isolated research strands, namely, digital phenotyping in mental health and stress and emotion research in urban studies. The analysis was guided by the three sub-questions presented in chapter 2.6:

- How are the enclosure and openness of the built urban environment experienced and implicated in physiological arousal, stress or feelings of comfort in FEP and ARMS persons?
- What role does visual and intersensory perception of the urban environment play in physiological arousal, stress or feelings of comfort in FEP and ARMS persons?
- In what ways are spatial transitions relevant to FEP and ARMS persons in their experience of urban environments with regard to physiological arousal, stress and discomfort?

Based on the methodology presented in the previous part, and through a specific analytical procedure implemented for each of the three research questions mentioned above, what follows is a refinement of the notion of urban stress for persons living with early psychosis and persons with an at-risk mental state for psychosis. As a whole, encompassing the innovative methodology and the resulting outcomes, this procedure aims to drive forward studies on urban mental health issues, by developing and testing new forms of enquiry. The next chapters are structured as follows: First, I draw a brief state of the art of relevant research in digital phenotyping and urban studies on stress and emotion. Next, I give details on the methodological aspects and the analysis and the study procedure. This discussion is complementary to the previous chapters. I then present the results according to the three research sub-questions and discuss these results and their implications for the study of the city/psychosis nexus. The presentation of my results will be followed by a concluding discussion, held in the fifth and final part of the dissertation.

4.2. Article III: Urban Stress and Emotional Arousal in Urban Environments

Marc Winz, Ola Söderström, Aïcha Rizzotti-Kaddouri, Steve Visinand, André Ourednik, Jennifer Küster, Barbara Bailey[33]

4.2.1. Foreword

The full title of the article is "Stress and emotional arousal in urban environments: a biosocial study with persons having experienced a first-episode of psychosis and persons at risk". This article is published in *Health & Place*, an interdisciplinary journal that brings together work from geography, sociology and public health interested in the interrelation of health and healthcare in which place matters.

4.2.2. Abstract

This article examines the entanglement between feelings of stress and discomfort, physiological arousal and urban experiences of persons living with early psychosis. It adopts a biosocial approach, using mixed methods that combine ambulatory skin conductance monitoring, mobile interviews and contextual data, collected through GPS and video recordings. The study draws on and strives to cross-fertilise two recent strands of research. The first relates to the use of digital phenotyping in mental health research. The second explores stress and emotional arousal in cities using ambulatory physiological measures. Empirically, the paper is based on fieldwork in Basel, Switzerland, with nine participants recruited within the Basel Early Treatment Service (BEATS), and four controls. We focus on three salient elements in our results: visual perception of moving bodies, spatial transitions and openness and enclosure of the built environment. The analysis shows how these elements elicit physiological responses of arousal and expressed feelings of discomfort. In the concluding section we discuss the methodological implications of these results and suggest the notion of *regime of attention* as a focus for future biosocial research on urban mental health.

Keywords: Urban environment, psychosis, at risk mental state, first episode psychosis, ambulatory skin conductance, mixed-method, biosocial, stress, arousal, urban stress

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4.2.3. Introduction

Prevalence of psychosis varies considerably according to geographical location: in the last two decades, a substantial number of studies conducted in Europe and North America show a strong correlation between urban living and the development of psychosis (Allardyce et al., 2001; Kelly et

[33] Winz, M., Söderström, O., Rizzotti-Kaddouri, A., Visinand, S., Ourednik, A., Küster, J., & Bailey, B. (2022). Stress and emotional arousal in urban environments: A biosocial study with persons having experienced a first-episode of psychosis and persons at risk. *Health & Place*, *75*, 102762.

al., 2010; Kirkbride et al., 2007; Mortensen & Pedersen, 2001; Sundquist, Frank, & Sundquist, 2004; Van Os, 2004; Vassos, Pedersen, Murray, Collier, & Lewis, 2012). Today, urban living is widely considered as a risk factor for psychosis (Vassos et al., 2012, p. 1118). Although urban living also affects other mental disorders — such as mood and anxiety disorders — it does so at a much lower rate (Peen et al. 2010). Therefore, the link between urban living and psychiatric disorders is very specific to psychosis.

Despite the identification of various factors associated with 'urbanicity'[34] that may potentially contribute to the development of psychosis, the nature of the link involved in this association – *why* and *how* the social and built environment of cities affect the risk for psychosis – remains unclear (Fett et al., 2019; Heinz et al., 2013; Helbich, 2018; Kelly et al., 2010; Manning, 2019; Peen, Schoevers, Beekman, & Dekker, 2010).

One prominent hypothesis is the role of stress (Krabbendam et al. 2021). Hence identifying which urban situations are the most stress-inducive as well as why they are so is of crucial importance (Abbott, 2012, p. 164), also because it may eventually lead to interventions oriented towards mental health-supportive urban design and planning.

Most studies in psychiatry interested in the urban-rural differences in prevalence rates approach the urban phenomenon through the fixed categories of urban birth, urban upbriging or urban residence. Studies that focus on cities – interested in prevalence rates across neighborhoods – work on areal level factors, such as social deprivation or levels of criminality (Kirkbride et al. 2014), social deprivation (Bhavsar et al., 2014), social adversity (Heinz et al. 2013), or density (Vassos et al., 2012). The static and substantialist conceptualization of space and urban environment that underpins such approaches, has been identified as a limitation in our understanding of urban stress (Söderström et al. 2016). Consequently, there have been recent calls in the social sciences and in psychiatry in favor of *in situ* studies, conducted on an individual level (Bromley et al., 2012; Freeman et al., 2015). One of the first studies in that direction is known as the 'Camberwell walk', where researchers looked at symptoms before and after a walk in a busy street for persons with persecutory delusions (Ellett et al., 2008; see also Freeman et al., 2015). In the same line of research, Ecological Momentary Assessment (EMA) using smartphones has been deployed (see Van Os et al., 2014 & 2017; Myin-Germeys et al., 2009). In EMA-based studies, participants are asked to answer questions about their feelings and emotional state several times over the course of a longer period of time (days or week), as well as giving simultaneously contextual information (e.g about their location, activity and entourage). Hence, studies within psychiatry developing these approaches are much more attuned to the relational aspects of the social and material environment and their effects upon wellbeing than traditional epidemiological approaches – a domain

[34] Urbanicity is the term used in research within psychiatry to refer to the effect of urban environments, generally defined through population density, on mental health. Within this literature, it commonly refers to urban birth, urban upbringing or urban residence. However, these categories are challenged by an experiential approach, because being born, raised or living in an urban area doesn't offer any information about how one "spends time in the city, or tends to avoid it, or deploys very selective forms of urban practice" (Söderström et al. 2016, p. 109).

where the social sciences have a long tradition. Recently, geographers and psychiatrists, in a common effort, have pushed further these investigations, using video elicitation and video analysis to explore how persons having had a first experience of psychosis handle stress in cities. The results show that urban stress for these participants relates to (i) urban density, (ii) high levels of sensory stimulation, (iii) unchosen social interaction and (iv) obstacles to fluid mobility (Söderström et al. 2016 & 2017). In another study, more focused on the physical environment, crowding, noise, light, air quality as well as housing type and quality have also been identified as urban stressors (Evans, 2013). However, as we have argued elsewhere (Author & Author, 2020), we see two limitations in most of these *in situ* studies. The first is to rely solely on the patient's narratives, and therefore on perceived stress that is verbalized. The second, closely related to the first one, is the lack of research into biosocial pathways.

We respond to these limitations by analyzing how urban environments get to the skin through urban experience of distress and arousal. More specifically, we are interested in how aspects relating to sensory perception, spatial sequences and the built environment are experienced and embodied (see Author & Author, 2020, for a detailed discussion of each of these research axes). Adopting a biosocial approach, the research uses mixed-methods, combining ambulatory skin conductance (hereafter SC), qualitative interviews and geographical and contextual data. SC – also called electrodermal activity (EDA) or galvanic skin response (GSR) – describes variations in the resistance of the skin to a small electrical current, measured through the activity of the eccrine sweat glands, which are under control of the autonomic nervous system (ANS) (Dawson et al., 2000). The involuntary changes in skin conductance are widely used as an index in different domains for cognitive and emotional processes arousal or attention, as well as stress (Boucsein 2012; Dawson 2000). SC has been used in laboratory studies as a psycho-physiological indicator of arousal, emotions and stress in participants with psychosis (Lincoln et al., 2015; Peterman et al., 2015, Dawson et al., 2010) and *in situ* to detect signature of illness severity (Cella et al., 2018). Here, we propose to take it out of the lab, to monitor *in situ* physiological arousal and stress in persons with early psychosis, which has not been done yet. We conducted our fieldwork in Basel, Switzerland, with five participants who have experienced a First Episode of Psychosis (FEP), four who have been identified as 'At Risk Mental State' (ARMS) [35] and four controls.

The article is structured as follows. We start by discussing the use of mobile health devices and biosensing, first within research on mental health, and second within research on urban environments. Then, we expose our methodology: the study design, the way we processed and analysed our data and their limitations. We focus the presentation of our results on three aspects - the visual perception of bodies in motion, transitions between urban contexts and openness/closure of these contexts - in a third section. We discuss these results and suggest

[35] Also known as 'ultra-high risk' or 'clinical high risk', 'at risk mental state' refers to persons who are considered, according to clinically established criteria, to present an increased risk of developing a psychotic disorder in a foreseeable future.

future research perspectives in a final section.

4.2.4. Mobile Health and Biosensing Research

Over the past decade, mobile health (mHealth) and sensor-based technologies have been increasingly used both in research on mental health and in the study of embodied experiences of urban environments. In this section, we briefly shed light on both of these research strands[36]. We point to the fact that they contribute to advances in their respective fields, but that research combining the two is scarce. Merging the two, we argue, should hone our understanding of the hyphen between them: the entanglement between cities and psychosis. In so doing, we also aim to respond to the call for the development of innovative methodologies, situated at the intersection of biology and ethnography (see Fitzgerald et al., 2016; Manning, 2019).

Mobile Health in Mental Health Research

Within research on mental health, the use of mobile technologies to collect data in everyday life is often referred to as 'digital phenotyping', and divided into 'passive' and 'active' data collection modalities (Raugh et al. 2021). The former refers to the monitoring of either physiological or behavioral variables – such as heart rate and skin conductance, or gestures and localizations (Raugh et al. 2021). In the latter, participants are asked to accomplish specific tasks, such as survey completion or share their state of mind, at various moments.

Historically, the 'passive' mode of research has been used in psychiatric research within laboratories, to detect biomarkers of illness and/or of various illness features, such as functioning difficulties in the context of schizophrenia (Cella et al 2017). The advent of mobile and wearable devices offers new opportunities, allowing to take these devices out of the lab, to examine the role and relevance of these biomarkers for various disorders in real-life settings (Adams et al. 2017). With regard to psychosis, SC has been used *in situ*, to study the association symptoms and functioning level and autonomic activity (Cella et al. 2017). Behavioral sensing (i.e., physical activity, geospatial activity, speech frequency, and duration) has been used to identify indicators of relapse (Ben-Zeev et al., 2017). Here, the spatial dimension has been explored: using passively collected smartphone behavioral data to identify changes in mobility patterns and social behavior, it has been found "that the rate of behavioral anomalies detected in the 2 weeks prior to relapse was 71% higher than the rate of anomalies during other time periods" (Barnett al. 2018, p. 436).

'Active' data collection methods have been implemented increasingly in research on psychosis. Smartphones based Ecological Momentary Assessment (EMA) has been used to study subjective emotional states and/or symptoms dynamically, over the course of various time frames (Myin-Germeys et al. 2003; Myin-Germeys et al. 2009; Gard et a. 2014; Moran et al. 2017; Oorschot et al. 2013, Oorschot et al. 2017; Kluge et al. 2018). Such EMA-based research has highlighted patterns of both positive and negative symptoms, in showing for example "individual moment-to-moment and daily variation in paranoia intensity,

[36] For a systematic review of each of these fields, refer to Adams et al. 2017, and Dritsa and Biloria 2021, respectively.

positive affect (PA), and negative affect (NA)" (Orschoot et al., 2012, p. 406) in persons diagnosed with schizophrenia.

'Active' and 'passive' modes have been combined in various ways in research on psychosis. Together, EMA and autonomic cardiac regulation, have been used to study stress (Kimhy et al 2009) and auditory hallucinations (Kimhy et al. 2017) in persons diagnosed with schizophrenia. Combined with passive GPS tracking technologies, EMA allows the exploration of the spatialities of such experiences, highlighting the fact that, in individuals living with a diagnosis of schizophrenia, greenspace is associated with lower symptoms of anxiety, depression and psychosis (Henson et al., 2020, p. 1). This combined approach also revealed that reduced mobility is associated with negative symptoms, particularly diminished motivation, but not with positive symptoms, depression or cognitive outcomes in patients with schizophrenia (Depp et al. 2019). In sum, mobile methods provide the possibility to explore and test laboratory findings in real-life or close to real-life situations. Moreover, such approach allows for an ecological – temporal and spatial – account of the lived experiences of people living with mental health problems.

Biosensing in research on urban emotions and stress

In recent years, urban environments have been the site of a growing number of studies using real-time physiological data collection – often referred to as 'biosensing' – frequently in combination with more traditional data collection techniques. While research using SC in this field was originally focused on emotions, there has been a shift towards stress-related research (Dritsa & Biloria, 2021; Pykett et al., 2020b). This still emerging strand of research has produced an abundance of literature in recent years. Researchers have explored physiological arousal using SC in a broad range of population categories, working with tourists (Kim and Fensemaier, 2015; Shoval 2018), police officers (Furberg et al., 2017), visually impaired adults (Massot, 2011), young men (Song et al. 2015) and older adults (Pratiwi et al. 2020; Neal, 2017; Tilley et al. 2017). These studies focus on various activities, such as walking (Hogertz, 2010; Hijazi et al., 2016; Li et al. 2016; Clark et al. 2018; Engelniederhammer 2019; Xiang et al. 2021), cycling (Zeile 2016; Werner 2019), commuting (Pykett et al. 2020a) and driving (Healy and Picard, 2005).

This body of literature is not turned towards questions of wellbeing and/or (mental) health (for an exception, see Pykett et al. 2020a), and to our knowledge, there are no studies involving persons living with a diagnosis of psychiatric disorder. However, in studies working on urban walking, several aspects of the social and built (physical) urban environments relating to physiological arousal are particularly interesting, since they resonate with research axes identified in urban mental health research (see Author & Author, 2020). These relevant features concern crowding density (Engelniederhammer 2019), visual fields (Hijazi et al. 2016; Li et al. 2016; Xiang et al. 2021) and urban sequences (Li et al. 2016; Xiang et al. 2021).

Personal space intrusion in high density areas has been found to elicit both aversive and positive emotional responses (Engelniederhammer et al., 2019). Discussing these conflicting results, the authors understand that the urban context may play a significant role in explaining these differences, but they could not

"uncover the specific aspects of the different street paths of the test route, to make personal space crossing eliciting aversive or appetitive responses" (2019, p. 643). Divergent results have also been found in relation to isovists, understood as "the area which is visible from a given point in space" (Dritsa and Biloria, 2021, p. 2021). Isovists allow researchers to work on the built environment – more precisely on the spaces between buildings – through various quantifiable parameters. In Zurich, Switzerland, greater visibility and higher compactness "seem to be advantageous in causing positive emotions, indicating that people may prefer spaces with good vista within a suitable distance and clearer boundaries. However, this does not mean that people prefer an unlimited field of view" ((Li et al. 2016, p. 15). Similar results have been found in Hong Kong (Xiang et al. 2021). However, conclusions differ on occlusivity, which refers to the degree of enclosure of a space (Xiang et al. 2021), with contrasting effects on autonomic arousal. Higher occlusivity can elicit both a sense of security (Li et al. 2016) and stress (Xiang et al., 2021). In relation to the way the urban environment is experienced, urban sequences, rather than specific urban places have been hypothesised as being crucial in eliciting physiological arousal (Li et al. 2016; Xiang et al. 2021). Given that urban dwellers walk, and therefore move through the city, it has been suggested that "urban spaces may influence people's emotional responses through both spatial sequence arrangements and shifting scenario sequences" (Li et al. 2016 p. 1).

In sum, this review of recent studies in two research fields shows: first, that research involving digital phenotyping – for assessing emotional arousal and stress in real-world settings among other aims – is increasingly implemented in research on mental health, and, second, that urban emotional arousal and stress research using ambulatory skin conductance is burgeoning and leads to a series of interesting yet diverging results with. However, no attempt has been made as of yet to cross-fertilise these two strands of research. This is what the study reported in this article does by examining the entanglement between feelings of stress and discomfort, physiological arousal and the urban experiences of persons living with early psychosis and persons at risk of psychosis. We suggest that, through this combination, we can offer important insights into the embodied experience of urban environments of people living with early psychosis and persons at risk of psychosis and thus advance investigations of one of the suggested biosocial pathways between urbanicity and psychosis: urban stress.

4.2.5. Methodology

Design and protocol

It is widely accepted that stress is a multifactorial phenomenon related to biological, psychological, social and environmental processes (Adli, 2017), and that it "comprises both physiological and psychological components in a short- and long-term perspective" (Hedblom et al., 2019, p. 2). In our approach, we focus on short-term, conscious and embodied expressions of stress. Therefore, our study design is based on a biosocial mixed-method approach, combining: (i) ambulatory biosensing – skin conductance – to examine physiological arousal and stress; (ii) narrative data collected through qualitative mobile interviews, to provide participants' interpretations of situations of arousal; and (iii) environmental data, collected through

GPS and video recordings, to provide a rich sense of the urban context. Data was collected during urban walks in the city center of Basel[37], Switzerland, with participants wearing an Empatica E4 bracelet to monitor skin conductance (SC). The Empatica E4 is a wrist-worn wearable device designed for continuous, real-time data acquisition in daily life. We selected the E4 because it offers a medical-grade device designed for research that is commercially available, and that is increasingly used in ambulatory biosensing in urban contexts (e.g. Chrisinger et al., 2018, Pykett et al., 2020, Shoval et al. 2018). With sensors placed on the inside of the wrists, the E4 collects simultaneously skin conductance, heart rate measures, blood pressure, and skin temperature. Skin conductance is collected at a sampling rate of 4Hz, and the frequency of data collection is not configurable. The data collected from the E4 is synched to an online platform, where the raw data is accessible. Participants were accompanied by the first author of this article, who conducted mobile interviews. Here, our approach draws on the "commented city walks" (Thibaud, 2013). This method consists in carrying out walks with informants, asking people to comment on their experience, feelings and relationship to space, both while walking and afterwards. The walks lasted between 45 and 60 minutes, followed by a semi-structured interview of 20 to 30 minutes. The path followed in the walks was partly imposed, for the sake of comparison[38], partly left up to the decision of the participants. It was monitored with a GPS tracker (Garmin eTrex 20). In addition, the urban environment was filmed by the researcher, with a chest-worn action camera.

Participants and recruitment

The participants we worked with in this study were recruited within the Basel Early Treatment Service (BEATS), a specialized mental health unit at the University Psychiatric Clinics Basel, committed to the early detection and treatment of psychotic and other serious mental illnesses in young people. We recruited participants between 18 and 35, having received a first diagnosis of psychosis less than 2 years prior to study participation, and with presence of psychotic symptoms in any form for less than five years (FEP, n = 5), and at risk mental state individuals (ARMS, n = 4), identified as such within the BEATS program according to established criteria (Andreou et al. 2019). Given that recruitment of participants living with early psychosis can be complicated (Patterson et al. 2014), our sample size was dictated by the number of participants willing to take part in the study. Pre-selection of eligible participants through the BEATS team proved to be very helpful here. All the patients meeting the inclusion criteria in the BEATS program have been contacted in a first step. A total of 23 participants expressed their initial interest in participating. Out of the 23 participants, 5 could not be reached for further recruitment process and 8 declined participation for various personal reasons. We invited the 10 remaining participants for a meeting, after which one declined to sign the informed consent document. Hence 5 FEP and 4 ARMS

[37] Basel is the third largest city in Switzerland, with an agglomeration of 550'000 permanent residents in 2019, spreading over three different countries. It is a medium-sized city, with densities varying considerably across neighborhoods, ranging from 4000 to over 20'000 inhabitants per square kilometer.

[38] This section of the path was designed to include various urban settings and configurations, such as busy and calmer roads, pedestrian areas, parks, squares, etc.

persons participated in the study. We also included a control group with similar size (n = 4). We worked with these three groups to identify potential differences in the way city environments may represent a source of physiological arousal and psychological stress.

All participants provided written informed consent to a research protocol that was approved by the local Swiss Ethics Committee.

Working at the confluence of health geography and psychiatry, the study protocol has been elaborated in collaboration with members of the BEATS team. Therefore, it partially follows existing standards within psychiatry. Participants were asked to take the Current CAPE-15 survey (Capra et al., 2017), which allows to evaluate psychotic like experiences (PLEs) and associated distress in the last three months. The survey was completed after the walk, during the debriefing interview. It comprises 15 items with 3 subscales (persecutory ideations, bizarre experiences and perceptual abnormalities). For each item, participants are asked to report on the frequency at which a specific symptom is experienced, and the psychological distress associated with it, using a 4-point Likert scale from 0 (never / not distressed) to 3 (nearly always / very distressed). Following Capra et al. (2017), we calculated the Frequency x Distress score (ranging from 0 to 135) for each participant. Mean scores are the following: FEP = 4.8 (ranging from 0 to 23), ARMS = 3 (ranging from 1 to 6) and control group = 1 (ranging from 0 to 2). This indicates that, although there are identifiable differences in symptom distress between the three groups, the participants in our study did not experience a lot of the symptoms assessed by the CAPE-15 in the three months preceding the study participation, and/or that the symptoms they do experience are not experienced as distressing. This can be explained by the ethical stance taken within our research, where exclusion criteria included severe hostility, suspiciousness or formal thought disorder as determined by the BEATS team and participants whose active participation in the study was considered at risk of decompensation by the BEATS team.

Skin conductance data processing and visualisation

SC data is reputed to potentially contain a lot of artefacts, especially in ambulatory settings. Hence, we first identified these artefacts and rejected invalid portions of the signal. Authors three and four implemented following rule-based approach to do so: first, raw SC was inspected for values below 0.01 µS, which indicates a loss of contact between the skin and the electrode. Second, we applied a moving-median filter (width 4, since SC is sampled at 4Hz), which is a common way to reject outliers (Posada-Quintero et al. 2019). Third, following Kocielnik (2012) and Kikhia (2016), we identified artifacts as portions of the signal showing more than a 20% increase or 10% decrease within one second. These segments were removed and end-points were connected using a cubic spline. After pre-processing the data, the final step concerned the extraction of relevant SC features. Skin conductance includes two main components, resulting from the sympathetic neuronal activity: (i) background tonic activity: skin conductance level (herafter *SCL*), and (ii) rapid phasic components: skin conductance response (*SCRs*) (Braithwaite et al., 2013: 4). Following the publication recommendations for electrodermal measurements (Society for Psychophysiological Research Ad Hoc Committee on Electrodermal Measures, 2012), we retained the SCL component for

our study in an ambulatory context. SCL has been widely used as an index of physiological arousal of emotions (Dawson et al., 2017), as well as an indicator of stress, both in lab (Hedblom et al., 2019) and ambulatory contexts (Kocielnik et al., 2013).

We used LEDALAB (Benedek & Kaernbach, 2010) and the continuous decomposition analysis approach, to decompose the SC signal into tonic and phasic components.

A typical practice when working with SCL, based on experiments carried out in labs, includes wearing the sensor prior to the experiment, while the participants are asked to relax. In an ideal case, the SCL signal drops to become low and smooth, and the lowest values are averaged to obtain a baseline measurement, which is then compared to the data collected during the experiment. Such 'resting baseline' anchored in lab-based practices are not necessarily appropriate in an ambulatory setting. This is why when working on walking tasks, Cho et al. (2021) use a walking baseline, measured during a flat level indoor walking period of two minutes before the outdoor experimental walking course. We choose to extract the baseline value from the data that was collected during the urban walks, for a baseline that holds more ecological validity, as recommended by the manufacturer[39]. To do so, we averaged the SCL data on a 12 second non-overlapping window for the whole walking period. SCL variations fluctuate over longer periods of time (typically, from 10s of seconds to minutes).

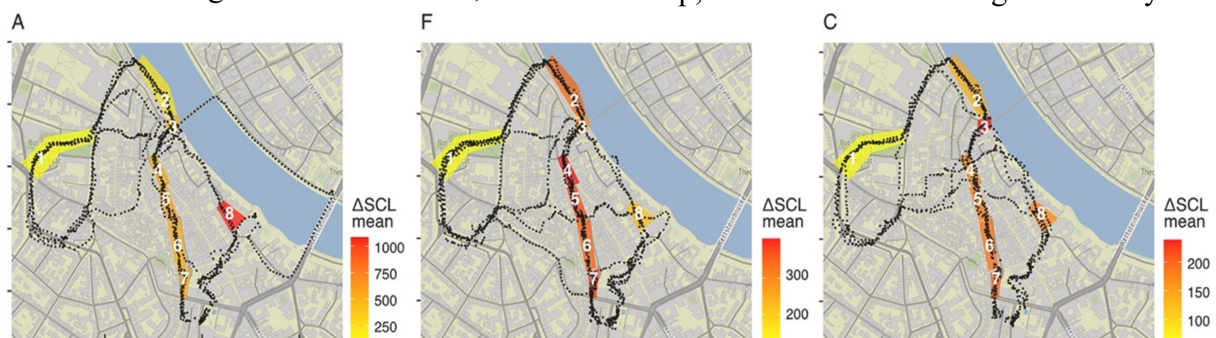
We chose a window of 12 seconds because it is the smallest common denominator between sampling frequencies of SC (4Hz) and our GPS data (3Hz). We identified the window with the lowest average, which provides the baseline skin conductance level during walking. We then followed standard practices and expressed the SCL for every 12 second window as the variation in percentage when compared to this 'activity-based' baseline:

$$\Delta SCL = ((SCLw - SCLb)/SCLb)*100$$

With:

%SCL = SCL variation from baseline
SCLw = SCL during walking
SCLb = SCL walking-based baseline

Calculating the percent variation within the walking period reduces the confounding influence of sweating caused by the physical activity, as well as the inter-individual differences in SCL amplitudes. In a further step, SCL data was then geocoded by the



Aggregated ΔSCL maps for each group

[39]https://support.empatica.com/hc/en-us/articles/203621955-What-should-I-know-to-use-EDA-data-in-my-experiment

fifth author, thanks to timestamps of the Empatica E4 and the GPS tracker using the 'trackeR' package in R (R core team, 2021; Kosmidis et al. 2021), to produce SCL percent variation maps for each participant (see fig. 1).

Analysis

Our analysis aims to identify relevant urban situations implicated in the advent of feelings of stress and physiological arousal in people living with early psychosis. Adopting an *in situ* approach, we are also particularly attentive to the way the urban environment –

in its interactional and geographical dimensions – is experienced by participants. We do so by combining physiological, narrative data and environmental data, in relation to the proximate urban environment encountered during the walks on two levels. In a preliminary step, we aggregated the ΔSCL data per group, to detect general patterns between FEP, ARMS and Controls. To analyse the data, we segmented the imposed part of the path in 8 contrasting and subsequent zones (parks, riverside, intersection, squares, heavy traffic road, pedestrian area, public transport hub). For each zone, we calculated the mean and median ΔSCL for the three groups of participants.

In a second step, since our main objective is to explore the personal experiences of urban situations and to unpack the "[…] temporalities, spatialities, and psychophysiologies of the 'moments of stress' (Kyriakou et al., 2019) for each individual participant" (p. 7), ΔSCL data was geocoded by the fifth author, thanks to timestamps of the Empatica E4 and the GPS tracker using the 'trackeR' package in R (R core team, 2021; Kosmidis et al. 2021), to produce SCL percent variation maps for each participant. Analysis of SC data is based on visual analysis of these maps, which are cartographic projections of descriptive statistical analysis of SC data. Such approach is common is studies working on the association of SC and environmental contexts in real-life settings (see Hogertz, 2010; Bergner et al., 2013; Chen et al., 2018; Fathulla et al., 2018; Osborne & Jones, 2017; Shoval et al., 2018). Transcription of the interviews was segmented into the geographical zones mentioned above. Coding of the interviews was theoretically guided, according to our research axes, and relevant verbatims were reported on a map of the city, for each participant using the video footage. In a following step, the three different datasets (video, narratives and physiological data by means of the SCL maps) have been examined and compared for each individual participant, to explore the way "how the various aspects of stress map together" (Pykett et al., 2020, p. 7). Here, our approach is inspired by Osborne and Jones (2017), who work with similar data, recommend to analyze data by means of triangulation, entering the analysis each time with a different set of empirical data (SC, qualitative interviews and video). However, they also note that the "reinforcing effect does not occur in every case, as things that seem interesting to the researchers in, say, the video footage, may have been of little significance to the participant, thus not appearing in the interview or biosensing data" (Osborne and Jones, 2017, p. 168). We chose to combine the three datasets in a specific manner for each of our research axes. To study the sensory dimension, we started with the narratives, and then enriched and densified analysis with the video recordings and the skin conductance maps. To investigate the importance of urban sequences, we started with the SC maps, and

confronted these to the narratives and enriched it with video. To explore aspects of the built environment, we started with video recordings, and confronted them to SC and interviews. The rationale for each analytical process is detailed in the following sections. Subjective or perceived stress does not necessarily overlap with physiological stress, or as Bettiga et al. put it, mind and body do not always agree, since “[u]nconscious arousal and conscious arousal are distinct emotional responses” (Bettiga et al., 2017, p.108). Thus, both the co-evolutions and discrepancies between skin conductance and expressed feelings are important. They are complementary, in that they participate in revealing different aspects of the relation between the participants and the urban environment.

4.2.6. Results

Aggregated-level

Using Pairwise Wilcox Rank sum Test, differences in mean ΔSCL were statistically significant ($p < 0{,}05$) between all three groups of participants for zones nº1, 5, 6 and 7. For zone nº 2, 4, 8, differences in mean ΔSCL were significant between ARMS and Controls, as well as between ARMS and FEP participants. In zone 2, the differences in ΔSCL were significant between Controls and FEP. Since the median is less spread than the mean, we produced aggregated median ΔSCL maps for each group, to allow comparison of arousal in the considered areas between groups

The spatially distributed median ΔSCL percent variations for each group of participants allow several general observations. First, they indicate lower values of ΔSCL in urban walking as well as a steadier level of SC along the path for Controls compared to ARMS and FEP participants. Similarly, the maps highlight a higher level of ΔSCL during urban walking for ARMS than for FEP. Based on this observation, urban walking is the most arousing for ARMS followed by FEP and Controls, in that order. As a result, in terms of physiological arousal, ARMS participants stand out. Second, for FEP and ARMS, some locations seem to exert stronger wear-and-tear on the physiologies of the participants, while situations allow for physiological recovery. Third, locations with low ΔSCL values show more consistency across all three groups. In contrast, places eliciting physiological arousal are more heterogeneously distributed throughout the city and across participants. The qualitative analysis of the interviews reveals contrasts between ARMS and FEP participants on the one side, and Controls on the other, with higher attention and sensitivity towards the urban environment, as expressed by the FEP and ARMS participants.

Individual level

We dig further into the entanglement of physiological arousal, expressed feeling of discomfort and the situational characteristics of the various locations in the following, using our three research axes: sensory perception, spatial sequences and aspects of the built environment as an entry point. Exploring individual subjective experience allows us to investigate the way how expressed feelings and physiological indices of stress relate to one another, by means of the localisation. The high resolution of ΔSCL cartography allows us to locate shifts in SC data with precision, and relate them to subjective feelings expressed either during the walk in that same location and/or during the debriefing interviews when commenting

Examples of ΔSCL maps for two participants

the walk. This association through space is of primary interest in our study. In localising ΔSCL and narrative data in the city, for each individual participant, we are able to highlight spatial associations of physiological and narrative data. However, it is hard to assert causality between the two.

Sensory Perception

To explore the way sensory perception is experienced, narrative data is of primary interest to start analysis with, since we retained the tonic component of SC (SCL), which indicates general level of autonomic arousal, and does not react to sensory stimuli per se[40]. Therefore, and because sensory perception has been commented on during the interviews, we chose to start our analysis with the narratives of our participants. In a following step, video recordings were analysed accordingly, to detect related situations, and the narratives were compared with the skin conductance maps, to pinpoint accompanying variations in ΔSCL.

As mentioned above, interviews revealed high contrasts between controls on the one hand and FEP and ARMS on the other. Sensory stimulations, and their impact upon wellbeing, are more present in FEP and ARMS narratives, compared to controls. While noise has been reported as a potential source of stress in our study and in others (Söderström et al. 2016), confronting our interview data to the video footage, we found that the parts of the city that were described as ‘calm’ or ‘hectic’, were so primarily from the point of view of what is going on around the participants. Moving elements (pedestrians, cars, streetcars, bikes, scooters and so forth) and especially situations where several of these elements travel at various speeds and take place at the same time and in the same location, were reported as difficult to manage and potential sources of stress:

[40] Here, the phasic component of SC – *SCRs* – would be more appropriate. However, in ambulatory setting it is not recommended to work with this component, since it is impossible to isolate relevant sensory stimulations and associate them with a specific skin conductance response.

> Interviewee: Here I have to... So there, I am often briefly a little... I look first, and only then I walk. Because it's a little bit of a switch after all. And since if we are already with this whole energy thing, here, much more is going on, I would like to pay attention somehow to everything, or should, because streetcars, bus, bicycle pedestrians....
>
> Interviewer: Then back there, the attention, was a bit less… ehm active or...
>
> Interviewee: I think it's a little bit more on the houses, and a little bit more focused on this [built] environment. And here it's so much more on everything that's moving, so I am a little bit like 'okay, there's someone running there, the bus, the streetcar, there's a bike trying to get through'. So I pay a little bit of attention to everything that's moving.

These visual situations are generally described as 'hectic' and can be paired with a sense of being a 'bit overwhelmed'. They are described as requiring 'more attention', where one 'has to be concentrated on what's going on' and on 'everything that's moving'. In these situations, participants felt that their attention had to be focused on the environment, in order to analyse what is going on, make a decision and act accordingly. These places can be experienced as stressful, also because of a sense of fear of acting wrongfully or 'coming in the way of other users':

> "I feel called upon to be more attentive, so to speak, so that nothing bad happens, so that I cannot be blamed for something".

In contrast to noise which, in our study, is reported to be a potential source of stress depending on the state of mind of the participants, these hectic situations – where moving elements have to be visually 'scanned' and taken into consideration – were described as being more consistently a source of discomfort. Some participants shared that they filter sensory stimuli in a sequential and/or hierarchical manner in such situations: visual perception and hearing come to the foreground, while other sensory channels are muted.

We took a closer look at one specific location – 'Barfüsserplatz' – to investigate the way these expressed feelings relate to physiological arousal. 'Barfüsserplatz' is located in the centre of the city of Basel, and with eight streetcar lines crossing it, the square is one of the city's most frequented transit hubs. For two FEP participants, entering and crossing 'Barfüsserplatz' is associated with a significant increase in SCL data. Without reaching peak intensities, the SCL rise occurs precisely at the entrance of the square itself, continues throughout the crossing, and starts to decrease only afterwards. In both cases, the increase in SCL values is accompanied by a negative judgement, as expressed by the participants during or after the walk. For the other three FEP participants, the SCL data does not show an upward trend for this section of the walk; the data either remains stable compared to the previous sections, or they show only very small variations, even with a slight downward trend for one of them. 'Barfüsserplatz' is commented less systematically by these participants, but characterised as 'lively' and 'animated' and 'full of people', without expressing any real judgment (positive or negative). Similarly, the SCL data of none of the ARMS participants shows a clear and strong upward or downward break at the entrance and during the crossing of 'Barfüsserplatz'. Here,

appreciation of the square is nevertheless generally negative; participants reported the need to be attentive, that they felt some kind of ambient stress, emanating from the people around them who rush from one side to the other or that the square is 'not very attractive'.

In sum, comparisons of video footage and narratives reveal that situations described as calm show generally low activity in terms of moving elements, and/or situations where the different travel modes are clearly separated. In contrast, hectic areas refer to places where several different kinds of moving elements converge in one place. While narratives identify such situations – described as hectic – as potentially problematic, SCL patterns in these hectic situations are variegated, showing no clear spatial association with physiological arousal of the participants. In contrast, SCL levels are more systematically low a place described as calm by the participant. While calm environments allow for reflection and introspection, as reported by the participants, this is difficult or impossible in highly animated environments, where all attention is laid on the surroundings.

Spatial Sequences and Transitions.

We chose to conduct the analysis of urban sequences and transitions with SC data as an entry, by means of our SCL maps, because SC has been reported to be sensitive to spatial transitions rather than to the atmosphere of specific places (Xiang et al., 2021). Instead of arousal hotspots, we looked at variations in SCL data along the path (where does it start to increase/decrease?) through visual inspection of the SCL maps. In a following step, we juxtaposed these locations to the narratives, in order to explore association with reported experiences and feelings, and to the video recordings to enrich our analysis.

Interested in points of fluctuations, we identified significant contrasts in SCL levels between two sections of the route: (i) the 'Drei Könige Weglein', a pedestrian path on the Rhine shore, shows very low SCL values for almost all participants (especially in the FEP and ARMS groups), and (ii) the following section of the path, 'Schifflände' and 'Eisengasse', which are busier roads and street crossings, where SCL values rise significantly for almost all ARMS participants, but not for the FEP participants. When compared to the narratives, we nevertheless find similar accounts across the two groups of how this transition is experienced.

Independently of the SCL patterns, the transition between the riverside and 'Schifflände' is repeatedly described in terms of attention, with participants noting that the section along the Rhine shore allows for introspective thoughts, rumination or relaxation, while one has to concentrate on the 'outside world' when arriving at 'Schifflände'. This overlaps with noticeable rises in SCL levels on the maps for 3 ARMS participants, while nothing in the SCL data of the fourth ARMS participant indicates autonomic arousal. However, when turning to the interview data, it is precisely this fourth participant who characterises this change most explicitly in terms of attention. He says that he 'strongly feels' the transition between the calm section at the banks of the river and the 'Schifflände' area, and what he notices is a change in his regime of attention: he describes the section at the Rhine as relaxed and that his 'attention was turned inwards' and that then it 'is suddenly turned outwards again'.

In contrast, only one participant's SCL level in the FEP group rose significantly in this location, while the others did not show any particular increase or decrease in SCL. It is noteworthy that FEP participants, in general, describe the transition from the 'Drei Könige Weglein' to 'Schifflände' in terms of unconscious adaptation to a novel situation, a novel environment. They point to a change in the regime of attention, which suddenly has to be more vivid, and directed outwards. But they feel they do not do it consciously: it is, they say, 'something that happens rather in the affect', that the 'body or head adjusts attention automatically' and that they do 'not really feel the change consciously'.

To conclude this section, it is interesting to note that 'Schifflände' is not arousing *per se.* When approached from a different angle, this location did elicit different, or even opposite autonomic reactions in three participants (1 FEP, 1 ARMS, 1 Control) with whom we passed the location twice. For these three participants, SCL showed autonomic activation on the first passage, when coming up from the riverside, but not on the second. This supports the hypothesis that the chronology and sequences through which these spaces are encountered play a role in autonomic activation and that a specific situation is not inherently arousing. The change in terms of attention might be at stake here although as we highlighted, it is embodied differently by the participants. While, in our case, ARMS participants generally expressed that they feel this change very consciously, FEP participants point to an automatic adjustment of the body or the mind.

Built Environment

The built environment is the elephant in the room in the study of the relation between urban environments and psychosis. Omnipresent, but difficult to operationalise, it is often left aside[41] in empirical research on the topic. We chose to investigate the built environment through its characteristics of enclosure and openness. In contrast to the aforementioned studies approaching these aspects through isovists, we chose not to compute isovist properties, because they rely on a static and two-dimensional projection of urban space. Instead, we documented the urban environment of every walk with a first-person perspective video. Enclosure and openness, the way they unravel during a walk, can be observed in detail. Therefore, we entered the analysis here through the video footage. We identified significant portions of the path in terms of changes relating to enclosure and openness of the built environment, and linked these sections of the walk to the interview and the biosensing data.

Through the video footage, we narrowed down the focus on locations where we entered or left a square, coming from or engaging into a much narrower street: 'Marktplatz' or 'Münsterplatz', two of the main pedestrian squares in Basel. 'Marktplatz' is circled by motorised traffic and welcomes the daily market (we crossed it during the afternoon, when the market had already finished), and 'Münsterplatz' is located in the old town and bordered by ancient buildings. Entering and crossing these squares triggers either downward trends or no impact on SCL data for all participants except two, indicating

[41] Golembievski (2016, 2017) discusses the relevance of the built environment to the city/psychosis entanglement and he discusses possible ways for the built environment to become 'psychotoxic'.

physiological deactivation. These SCL patterns are accompanied by positive appreciation of the squares in the interview data. Upon entering these squares, participants often describe them as more ‘open’. Hence, the built environment is characterised in such situations from the point of view of its enclosure and openness. Generally, this is immediately put into relation with how the space is occupied: the fact that people are scattered is appreciated. Adding the fact that these squares are pedestrian areas where no other kind of transports is allowed, these situations become ‘overseeable’, as several participants observed. This refers to their ability, to grasp and understand the situation in its entirety, which conveys a sense of manageability, controllability and risk reduction. Having an overview also allows them to gauge the situation, to evaluate ‘the amount’ and ‘kind of people’ present, and adapt one’s attitude or itinerary accordingly. While openness is generally appreciated, it has its downside as well, since it entails exposure. The fact that there are not too many people in a square is paired in one FEP participant with a ‘slight feeling of being observed, at least of being exposed to the view of everyone’. She explains that she feels it, but that it doesn’t really bother her. In this case, no arousal was associated with it.

Significant rises in SCL data on these portions of the route are identifiable in two participants only. SCL values increased in one FEP on ‘Marktplatz’ and one ARMS on ‘Münsterplatz’. We hypothesise here that arousal can be associated with elements relating to the interactions between researcher and participants. First, the ARMS participant associates the area with very positive memories, since she went to school there. Second, the interaction between the participant and the researcher also gives crucial insights into the potential reasons for this physiological arousal. Arriving on ‘Münsterplatz’, we asked participants, as they were previously informed, to take the lead and decide which way to go, in order to eventually return to the starting point. This particular participant explained that this is something she has trouble achieving. Similar interactional dynamics may explain the rise in SCL data in the FEP participant. When crossing the square, the participant explained in detail and very vividly what she went through and how she perceived her environment during a manic episode.

In sum, entering and crossing the two squares elicits generally downward SCL trends or no arousal. This physiological reaction overlaps with positive appreciation of the openness of these squares, which is associated with an overseeable environment. The exceptions to this finding highlight the importance of the interactions between researcher and participant.

4.2.7. Discussion and Conclusion

We discuss our results on two levels; first, we summarize main results and suggest future research perspectives through the notion of *regime of attention*, which we see as a connecting point of our three research axes. Second, we discuss the limitations of our study. Finally, we put our approach in perspective with recent developments in urban studies on the one hand, and mental health research on the other.

Walking in urban environments elicits higher physiological arousal in ARMS participants that in FEP and controls. While acoustic stimulations have been found to be a source of stress for young patients living with psychosis, we found that visual perception of elements in motion were experienced as

problematic. However, we found no direct and consistent association with physiological arousal, meaning that expressed stress relative to this aspect does not necessarily correspond to physiological stress as measured by skin conductance. The visual environment, which has been less documented in research as yet, proved also to be important with regards to the built environment. This was revealed by narratives and physiological data, since a wide field of view allows for FEP and ARMS participants to observe and analyze the situation they are confronted with, and adapt their attitude or route accordingly. This could be explained by impairments in basic visual function – e.g perception of contrast, speed and orientation – that have been found in individuals with psychosis and clinical high-risk groups, in laboratory settings (Türközer and Ross, 2021). Saccadic eye movement and deficits in smooth pursuit eye movement, which allow to track objects in motion, have thus been established as a biomarker for psychosis (Brakemeier et al. 2020). Much less is known about the relevance and implications of such impairments for patients in daily life activities, such as walking (Kogata and Iidaka, 2018). Eye-tracking technology, increasingly used to work on biomarkers of schizophrenia (Morita et al., 2020), could be used *in situ* to further investigate our findings. Finally, our analysis of spatial sequences showed that the urban environment does not permanently exert wear-and-tear on the physiologies of the participants: certain situations, such as the riverside, decrease physiological arousal. However, transitions between these situations act like triggers of attention.

Common to these results is the importance of *regimes of attention*[42]. While walking in an urban environment, participants' attention shifts from an inward examination of thoughts, ideas and feelings, to a careful scrutiny of their surroundings. Situations that are experienced and described as calm allow for introspection. In our study, these are generally associated with low physiological arousal. On the opposite, hectic environments, and the perceptual stimulations that come with them, engage attention towards the outside world. In such situations, sight and hearing predominate. Transitions between calm and hectic environments thus act like triggers moments that prompt a switch in the *regime of attention*. In future work, we will investigate further the relations between urban transitions and regimes of attention.

There are limitations to our research. The first is the sample size, which is rather small. This is primarily due to the difficulty in recruiting participants within the BEATS and other early psychosis programs and to our time-intensive methodology. The sample size is nevertheless comparable to other studies working with ambulatory SC in urban contexts with similar approach based on visual analysis (Bergner et al., 2013: n = 7; Zeile et al., 2016, n = 12; Chen et al., 2018 ,n = 4; Fathulla & Willis, 2018, n = 9). Second, for ethical reasons and following the publication recommendation of SC measurements on that matter (Society for Psychophysiological Research, 2012), medication intake was not interrupted for the

[42] Attention has been defined as a "cognitive function that allows humans and other animals to continually and dynamically select particularly relevant stimuli from all the available information present in the external or internal environment" (Talsma et al. 2010, p. 402).

purpose of the study. Results of studies on effects of medication on autonomic arousal are contrasted and mainly carried out in lab. Nevertheless, it has been found that “skin conductance level can serve as a stable and useful index of autonomic arousal in clinical trials, even in patients using beta-blocking medications” (Jacobs et al., 1994, p. 1170). Third, our approach allows to identify spatial associations between expressed feelings of stress, arousal or wellbeing and SCL patterns. However, in localising SCL and narrative data in the city, we are able to detect what spatial associations between physiological and narrative data. However, due to the real-life and in situ approach, we cannot determine definite causality between physiological arousal and narratives. Fourth, our research is committed to the study of the impact of the proximate environment, and to the study of event- and context-based distress. Thus, our study design did not allow us to extend the analysis neither to broader socio-contextual factor that come into play[43], nor to the cumulative and long-term effects of distress. Future research should work towards integrating these dimensions. Finally, the presence of a researcher, the fact that the participants had to wear the Empatica E4, that the discussion was recorded and the environment was filmed all participate in creating a situation that is still an experimental set-up, rather than truly representative of ordinary daily life. However, the methodology we developed and implemented in this pilot study, is informed by and contributes to current epistemological debates and methodological developments, both in urban geography and mental health research. In addition, our observations provide a starting point for future research.

Ambulatory monitoring of physiological variables is still dawning. In geography, ambulatory physiological measurements are increasingly used to study how persons are affected by their (urban) environments, “offering cultural geographers and others a significant new technique for examining questions around embodiment” (Osborne and Jones, 2018). However, in this research strand, questions of health and wellbeing remain marginal (for an exception, see Pykett et al., 2020; Chrisinger and King, 2018), and issues of mental health even more. This is the terrain we have sought to explore. Working with persons having experienced a first episode of psychosis and persons ‘at risk mental state’, we extend in this paper research on urban emotional arousal to bear on important questions of mental health. Mobilizing physiological measures, contextual data and narratives, we have developed a mode of analysis inspired by Osborne and Jones’ (2018): a hypothesis-driven data triangulation that allowed us to grasp aspects of the « affective complexity of moment-to-moment bodily engagements with the environment » (Amin & Richaud, 2020, p. 863) of persons living with early psychosis and those identified ‘at risk mental state’. Such endeavor overlaps with recent calls from sociologists working on urban mental health to embrace a biosocial approach to the city-psychosis nexus, in order to work towards a “thicker ontology of urban mental health” (Fitzergald et al. 2016, p. 154). However, “it is not immediately clear how to put this strategy into practice” (Manning, 2019, p. 2). The methodological

[43] See Pykett et al. (2020) for a critical discussion on the importance of such macro determinants in biosocial research.

procedure we experimented in this paper, based on the possibilities offered by ambulatory biosensing and digital phenotyping, is one of the ways to "develop a finer-grained, ethnographically informed analysis of the accumulation of urban situations that constitute stress and their spatial, temporal and sensorial characteristics" (Rose, 2020, p. 46).

In times of rapid urbanization, where cities emerge both as crystalizing multiple (mental) health risks[44] and as an important resource able to tackle these questions, it is crucial to pursue efforts towards a better understanding of how specific elements of the urban environment affect embodied experiences, how they impact perceived and physiological stress, and more generally our wellbeing and quality of life. In recent years, health has been put on the agendas of city governments, through programs such as the *WHO Healthy Cities movement* or initiatives such as *Thrive in the City*. Biosensing and digital phenotyping have been suggested as holding great potential for informing healthier urban design and planning strategies (Ellard, 2015; Millard et al. 2021). Our approach highlights that, while holding great potential, physiological measures alone are far from sufficient. Moreover, prioritizing biological (stress) responses to environment while sidestepping conscious and lived experiences, entails the risk of creating "a less human(e) account of urban stress" (Pykett et al. 2020).

[44] It is worth reminding here that urban areas are not inherently harmful, that they are also associated with positive health outcomes (Galea et al., 2005), in particular through greater (mental) health services availability (Sørgaard et al., 2003).

5. General Conclusions

5.1. Introduction

In this concluding part, I first discuss my research's contributions on four different levels. First, I examine the contributions of the three articles that structure the dissertation. This allows me to underline the way these three publications fit within the scope of a congruous analysis and highlight their contributions to the field of urban mental health more generally. Furthermore, I discuss my empirical contributions to the study of the city/psychosis nexus and how they relate to my main research questions. Next, I critically discuss the interdisciplinary approach I developed, situating my approach within ongoing practical, ethical and political debates in the social sciences and psychiatry that surround the use of ambulatory biosensing/digital phenotyping. It is in this section that I also address limitations, in addition to those discussed in the empirical article (section 4.2.6). To conclude, I propose future research trajectories.

5.2. Main contributions

The aim of this study was to refine our understanding of urban stress for persons living with early psychosis and persons with an at-risk mental state for psychosis, as stress has been suggested as a plausible pathway linking urban living and an increased risk of psychosis. On a more general level, my doctoral research aimed to expand the field of mental health geography by developing a biosocial approach to urban mental health questions. I examine here the theoretical (article I), methodological (article II) and empirical (article III) contributions of my research to the city/psychosis nexus and to mental health geography.

This study was informed by and contributes to a trend in mental health research which takes into consideration the quotidian environment of patients. To this end, I first elaborated a conceptual framework that aimed to anchor such a perspective in ongoing theoretical debates in human geography, urban sociology and architecture (Article I). Here my research contributes to theoretical debates on two levels. On the one hand, the first article of the dissertation sought to establish a dialogue between proximate but distinct concepts – *ambiance urbaine* and affective atmospheres – that evolved a little bit in silos, kept at bay by language boundaries. On the other hand, the confrontation of these notions allowed me to unearth lines of investigation that foreground an experiential perspective and an *in situ* approach to the studied phenomenon. While I am not the only one pursuing such an endeavour, the article provides fertile conceptual ground upon which to think the "impact on mental states of places negotiated by vulnerable subjects" (Amin & Ash, 2020, p. 873). The 'atmospheric approach' to the city/psychosis nexus suggested in the first article invites us to pay attention to the sensorial impact of urban environments, to try to grasp the effects of the built environment, as well as the impact of spatial transitions and disruptions of ambiances and atmospheres. In addition, it suggests take into consideration the (cumulative) effect of minor stress events in urban environments.

Concurrently, by means of the discussion of the differences between *ambiance urbaine* and affective atmosphere, the first article argues that the two notions stress slightly different registers of experiences; whereas *ambiance* accentuates a perceptual, sensory and narratively expressed level of experience of urban environments, affective atmosphere highlights a more

pre-reflective, bodily and visceral dimension of experience. This provided the ground upon which I elaborated a methodology for my fieldwork.

The second article of the dissertation moves from this conceptual level to a methodological one. The article identifies the limited account of what the 'social' and 'urban experience' means in existing lab-based biosocial studies, and it reveals a dearth of experimentation in biosocial approaches in the social sciences. The methodological proposal underpinning my research follows the argument that an experiential approach allows the observation of the role of specific urban places and situations, and hence contributes to a more fine-grained understanding of the city/psychosis nexus. It is widely accepted that stress is a multifactorial phenomenon related to biological, psychological, social and environmental processes (Adli, 2017), and that stress "comprises both physiological and psychological components in a short- and long-term perspective" (Hedblom et al., 2019, p. 2). In my approach, I focus on short-term conscious and unconscious/bodily expressions of stress. As such, it is an attempt to overcome the static and intangible definitions of "socio-economic stressors" or "socio economic stress" generally used within the urban-psychosis nexus literature. Therefore, my study design is based on a biosocial mixed-method approach, in order to explore urban stress as an emplaced, experiential and embodied/bodily phenomenon, as well as the contingencies of these experiences. I operationalised conscious expressions of stress through subjective self-reports of affective feelings and I operationalised physiological stress through skin conductance level (SCL). The integration of environmental data through GIS information as well as visual data provided a fuller account of the urban context than in similar research thus far.

Methodologically my research is a response to the mainly decontextualised analyses of the city in the life sciences and psychiatry (although, as noted, there are exceptions), as well as to the disembodied geographical and ethnographic accounts of urban experiences that do not engage with the biology and permeability of human bodies. Adding affective/bodily reactions to the cognitive and conscious expressions of stress allows me to draw a more complex picture of the ways in which urban situations affect individuals living with early psychosis and persons with an at-risk mental state for psychosis, and take the research towards biosocial mechanisms. Only a very small number of similar biosocial studies have been conducted so far, using cardiac autonomic regulation (Kimhy et al., 2010) and salivary cortisol (Collip et al., 2011) combined with Ecological Momentary Assessment to assess stress in 'real world' situations for persons with psychosis. New and better approaches to the study of urban experiences are of crucial importance to bridge the "gap between identifying correlations between measured psychological traits, states, and environments and outlining causal mechanisms at an expanded level of explanation" (Pykett, Osborne & Resch, 2020, p. 1939). Concurrently, elaborating adequate biosocial methodologies is considered as one of the major challenges of this research agenda (Pykett, Osborne & Resch, 2020, p. 1941). My study is an exploration of one such possibility. I propose an innovative approach to the city/psychosis nexus that draws on elements of laboratory research and research 'in the wild' (Callon & Rabeharisoa, 2003). I am well aware that mine is but one of many possible methodological approaches and that, at this 'exploratory' stage, it is not without complications. A limit to my approach lies in the fact that, in focusing on the immediate encounters between the participants and the city, I do not consider more structural social dimensions, such as social deprivation and social cohesion, ethnicity and

segregation or discrimination. Moreover, the methodology cannot account for the long-term cumulative effect of urban stress.

The third article takes the theoretical and methodological reflections to the field, and puts them to the test. It seeks to answer the main research question that guided the research:

> How is the experience of the social and material urban environment involved in creating physiological arousal, stress and feelings of well-being in persons having experienced a first episode of psychosis and persons with an increased risk for psychosis?

In response to this question, the study offers an empirical and situated account of certain urban characteristics that are experienced as stressful by person with early psychosis and persons with an at-risk mental state for psychosis. Walking in urban environments elicits higher physiological arousal in ARMS participants that in FEP and controls, as well as it elicits higher arousal in FEP than in controls.

The impact of the built environment, so often ignored in studies on the city-psychosis nexus, was identified as relating to aspects of openness, which are associated with positive feelings of control in a given situation. This feeling is associated with physiological deactivation. In contrast, busy and hectic environments have been described as stressful. Here visual perception of moving bodies proved to play an important role. This is something that was underexplored in other experienced-based studies, where noise seemed to be more prominent as a source of stress. However, this expressed feeling did not overlap with a clear pattern in physiological data. This highlights that consciously experienced and expressed arousal does not necessarily reflect a bodily arousal, as monitored by skin conductance at least. The opposite is true as well, since not every moment of physiological arousal was described as noteworthy by the participants. This connects with the results of a recent research in marketing, using self-declaration and skin conductance to study conscious and unconscious arousal and its effect on product attitude formation (Bettiga et al., 2017). The authors conclude that the body and the mind do not always agree, that conscious and unconscious arousal "are two independent emotional responses and they influence attitude toward the product differently" (Bettiga et al., 2017, p.108). Thus, both the co-evolutions and discrepancies between skin conductance and expressed feelings are important and complementary, in that they participate in revealing different aspects of the relation between the participants and the urban environment.

Finally, the study revealed that certain portions of the urban environment are systematically experienced as calm. These specific areas allow participants to shift their attention to themselves, to immerse themselves in their own thoughts. Arrival in a more animated environment acts as often as a trigger, and attention is laid on the surroundings. The different ambiances and atmospheres and their sensory stimulation demand varying levels of attention and concentration towards the outside world, as well as they offer various sensory affordances. This is why I frame the way participants navigate in urban environment as determined by fluctuating 'regimes of attention'. Since I just briefly suggested this aspect in the third article (sect. 4.2.6) of the dissertation, I will briefly elaborate on this question here. I will schematise the discussion concerning attention in urban context and psychosis by distinguishing between a cognitivist, an ecological and a sociological approach.

Research on attention originates in psychology. As a matter of fact, the definition given by psychologist and philosopher William James in 1890 is still often used as a basic definition for attention, also because today it is difficult to propose a general theory of attention that makes consensus across all the disciplines interested in the topic (Campos et al., 2020). James defines attention as follows:

> Everyone knows what attention is. It is the taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought. Focalization, concentration, of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others… (James, 1890, cited in Luck & Gold, 2008, p. 40)

Interest in attention gained significant momentum after WWII, with the advent of cognitive psychology, that paid attention to the processes at hand in attention. Here, attention has been defined as a "cognitive function that allows humans and other animals to continually and dynamically select particularly relevant stimuli from all the available information present in the external or internal environment" (Talsma et al. 2010, p. 402). This process has been described using different categories, or 'modes of attention'. It is often proposed that attention can be 'selective', 'sustained', 'divided' or 'exploratory' (Dufour et al., 2018).

In this cognitivist approach, selective attention refers to the ability to focus on a specific and relevant stimulus or feature of a stimulus, while inhibiting distracting elements. For example, in 1953, Colin Cherry coined what is known today as the 'Cocktail party effect', which refers to the capacity of following up the speaker's speech while filtering out others, in a highly complex sound environment, where multiple discussions take place simultaneously (Bronkhorst, 2015). Sustained attention, refers to the ability to maintain a high and stable level of focus on an activity or a stimulus over a longer period of time, while on the other hand, divided or exploratory attention generally refers to the ability to focus on and process more than one stimulus. Thus, attention deals with the faculty of selecting contextually relevant information and stimuli for further processing. Furthermore, attention is generally categorised in two distinct modes of operation, according to the driving source of it, which refers to the 'external' and 'internal' environment mentioned by Talsma and colleagues in the above cited definition: (i) bottom-up and (ii) top-down attention. The first refers to the process by which attention is guided by external sensory stimuli that stand out, because of their specific properties, in comparison to other stimuli (Katsuki & Constantinidis, 2014, p. 509). These stimuli 'catch' our attention, and "[s]uch attentional responses to the environment usually entail automatized performance at the sensory-physiological and motoric levels, requiring low levels of effort or awareness" (Campos et al, 2020, p. 3112). The latter refers to internal guidance of attention, on the basis of personal goals and plans (Katsuki & Constantinidis, 2014) and directs our senses to stimuli that match our beliefs or knowledge, our interests or motives, thus contributing to perform an action or a task, and successfully achieve a goal". This connects with a broader acceptation of attention as a limited resource, in times and spaces where demands on our attention are ever-increasing and where "[o]ur attentional system is responsible for filtering incoming information and allocating limited resources to a subset of input" (White & Shah, 2019, p. 115). One of the most prominent issues when it comes to attention is the abundance of

bottom-up external information and sensory stimuli that have to be treated concurrently with top-down attentional process, and the ability of the brain to do so:

> In many real-life situations, the two attentional processes, *bottom-up* and *top-down*, interlace with one another resulting in stimuli becoming salient in the achievement of a goal, thereby creating a state of cognitive competition. (Campos et al, 2020, p. 3112, emphasis in original, references omitted).

In this line of investigation, attention has been studied in persons diagnosed with schizophrenia, and it is widely accepted that schizophrenia involves various kinds of deficits of attention (Luck & Gold, 2008; Minas & Park, 2007), notably in sustained and selective attention (Mulet et al., 2007). Thus, it is estimated that persons diagnosed with schizophrenia experience difficulties focusing on relevant events while in filtering or ignoring irrelevant stimuli (Minas & Park, 2007)[45], which is also known as 'attentional inhibition':

> Attentional inhibition is the ability to suppress task-irrelevant cognitive processing and ignore salient yet irrelevant features of the situation. (Howard et al, 2014, p. 1)

However, studies that came to these conclusions are lab-based. Therefore, while it is estimated that "Abnormal attentional inhibition in individuals with schizophrenia is thought to be detrimental to ongoing information processing and to influence all aspects of behavior" (Minas & Park, 2007, p. 148), its effect on impairment in daily activities is less understood. This becomes important with regard to the experience of urban environments, usually considered to be demanding in terms of attention, as depicted by White and Shah (2019) in an article on the differences in attention between urban and natural environments:

> "In a city, even relatively simple tasks are cognitively taxing. Let's consider [a] visual search-type task. This time, you're a pedestrian trying to locate a particular street intersection during midday traffic. Top-down attention will prioritize goal-relevant information. But wait—you're on foot, and the visual space is full of static and moving objects—this means multiple goals, which changes the scope of what is "relevant." The street signs that indicate the intersection— your target—are relevant to your search. But, other input in the search space, despite not meeting search criteria, may be relevant; for instance, crossing signals are important for safe navigation. The street signs and signals would probably appear over-head. But, if you only attend to that spatial location, you might trip over a fire hydrant! Along with static obstacles, you'd need to be aware of other pedestrians, bikes, strollers, etc. Of course, you're in a city, so there will be a lot of distractions. Many are designed to capture your attention with features of luminance and motion (*e.g.*, flashing advertisements). And, some distractors will be salient *and* in the search space (*e.g.*, neon overhead signs for sidewalk eateries). The cognitive control required to manage the interference of salient distractors would further deplete limited resources. And, if this scenario were more realistic, you'd probably be on your phone too". (p. 116, references omitted)

While this vignette might sound a bit like a caricature, such cityscape solicitate and impose increased attentional demands on urban-dwellers. In my study, certain environments seem indeed to trigger more intensive bottom-up attention. These situations may need a period of

[45] It has been suggested that psychotic experiences result from aberrant assignment of salience to irrelevant stimuli (see Kapur, 2009), mediated by an excess of dopamine: Kapur proposes that excess striatal dopamine may lead to aberrant assignment of salience to otherwise irrelevant stimuli. According to this model, psychotic experiences emerge as a "top-down" cognitive attempt to make sense of experiences that are aberrantly salient. (Reinighaus et al., 2016, p. 713).

adaptation, where the selective process of salient stimuli takes more time, and can be a source of overload, discomfort or stress in persons with early psychosis and in persons with an at-risk mental state for psychosis. These situations, and their duration, can create fatigue due to intensified vigilance and concentration; spending time in an urban environment is thus sometimes described as tiring. They show the importance of envisaging attention ecologically, as proposed for instance by cultural theorist Yves Citton (2014).

Such an ecological perspective insists on the relational dimension between (individual) attention and environment, and on attention as situated within a larger context, where technical, architectural and urban designs are set up to capture attention. In times where demands on our attention are ever-increasing, Citton argues that we should examine how these different environments condition our attention, the 'attentional experiences' they produce (Citton, 2014b)[46], and consider the short- and long-term consequences of these solicitations. Seen in this light, the way we shape our 'attentional environments' becomes fundamental (Citton, 2014b)[47]. This stance induces an important shift: it locates attention not simply within an individual, but also in the surrounding environment which, in the case of a city, is produced by architects, urban designers, etc. Thus, it raises the important question of how we can arrange urban environments that aren't excessively demanding in terms of attention or allow attention to be restored, not only for persons living with psychosis but for everyone.[48]

Navigating urban environments is not homogenously characterized by streams of permanent solicitations. Some environments are more demanding in terms of bottom-up attention, while others solicitate attention, and allow participants to relax a little bit, or to dive into introspective thoughts. Thus, the situated approach followed in my research highlights a tension between bottom attention and top-down attention according to these situations. In my study, visual perception of the urban environment and switching between different ambiances and atmosphere seem to play an important role in this oscillation. Moreover, while there are urban situations that are more or less demanding in terms of bottom-up attention, there are also modes of engagement with the environment which may vary within each of these, that dampen or enhance external solicitations. Working with FEP persons, my colleague Zoé Codeluppi (2019) uses the term 'intensity of engagement', borrowed from the sociology of action of Laurent Thévenot, in order to "point out how participants are constantly adjusting their involvement with the material, social, emotional and sensory resources of the environment, according to the frequency and intensity of symptoms" (Codeluppi, 2019, abstract). Codeluppi describes varying intensities in practices of engagement over short and longer periods of time, that alternate between withdrawal and reconquest of urban spaces. Here I refer to 'engagement' in the sense of attentional engagement with one's surroundings, rather than practical engagement, that characterises the different regime of attention.

This recent work calls for a broader conception of attention in studies on psychosis, beyond a cognitivist approach where attention is triggered by environmental stimuli. Attention should be viewed as a mode of experience, a way of being in the world, or (dis-)connected with the city

[46] My own translations of "expériences attentionnelles", which are the terms used by Citton in french.
[47] My own translation of 'environnement attentionnels' used by Citton.
[48] I pursue this discussion in chapter 5.4, where I suggest future research trajectories.

(During, 2010). The *blasé attitude* famously described by Simmel is an example of a distant, unattentive urban dweller. While the blasé attitude is considered by Simmel as a protective mechanism, it is also linked with boredom and lack of concern. More recently, During (2010), proposed to frame such attitude in a different way:

> beyond the automated response triggered in the hyperstimulated urban subject, 'parrying the shocks' can also take a positive and potentially emancipating turn, provided that one can see in it a capacity to develop new perceptive skills. (p. 272).

Sociologist Anthony Pecqueux, proposes the concepts of "perceptual adjustment in situation"[49] and "sensory torque" (Pecqueux, 2009, 2014), to refer to "an instability between two sensory commitments: between the commitment toward a solitary activity (listening to music, and sometimes reading, etc.), and the commitment toward the urban sonic environment" (Pecqueux, 2009, p. 1). Pecqueux works with people listening to music with their headphones while walking in urban environment. He depicts a gesture that is very similar to what two of the participants to my study described. To sharpen sensory perception in hectic situations, two participants explained that, if they are listening to music, they sometimes have to take off their headphones and stop the music, in order to be more attentive to the environment, especially in hectic situations. It is easy to see here the tension between bottom-up and top-down attention discussed above, and the concepts proposed by Pecqueux precisely capture such these new 'perceptive skills', and thus fall within the scope what I frame rame with regimes of attention.

In sum framing the way participants navigate in urban environment according to varying 'regimes of attention' is a tentative way to explore the immersive experiences and relation to the environment developed by the participants, across different disciplinary acceptations of the concept of attention. It is drawn up on a cross-fertilizing of cognitive, ecological and sociological understanding of attention, that capture the idea of bottom-up and top-down driven attention, its fundamental relational aspects – where attention is also 'inscribed' in our environment – and the way of 'being into the world' – the way we plug our ears or senses towards this environment, through various skills and attitudes. In the next section I further discuss interdisciplinary aspects of my research approach, in the broader context of biosensing and digital phenotyping research, as well as I elaborate on the related limitations with regard to my study.

5.3. Interdisciplinarity *en acte*: on methodology, opportunities and limitations

This chapter critically discusses issues relating to the interdisciplinary approach implemented in the present study. Interdisciplinary research is currently one of the most promoted research practices (MacLeod, 2018), yet it is not an easy task. Aside from institutional difficulties that relate to funding opportunities, evaluation of work by peers in academic journals and career opportunities or building up a profile for young researcher (Fitzgerald and Callard, 2015), interdisciplinary work comprises some very practical hinderances, related to conceptual and empirical barriers that confronts research across disciplines (McLeod, 2016). Thus, the

[49] My own translation of "ajustements perceptifs en situation".

interdisciplinary research process comprises multiple difficulties, including linguistics, epistemologies and methodology (Callard and Fitzgerald, 2015; MacLeod, 2018; Braken and Oughton, 2006).

For one part, concepts have different meanings in different disciplines (this is true not only across disciplines, but also within disciplines) and relate to different ontologies, so one of the first difficulty when working interdisciplinary manner is to find a common ground, or at least be aware of these differences, in order to avoid fundamental misunderstandings (Braken and Oughton, 2006) and incoherence. My project is not the situated within a group of researchers stemming from various horizons, but originates in a single person, me, trying to integrate approaches from various disciplines to study a specific phenomenon. Hence, the question of dialogue is not so much the core difficulty, rather is the need and struggle to get acquainted with heterogenous literatures (Callard and Fitzgerald, 2015), with which I was not familiar. I discuss these issues in the first section of this chapter (5.3.1). Then, however, emerges the challenge to build bridges across various acceptations of concepts, in order the build a coherent framework, that reaches across disciplines. This is what is discussed in the first section of the chapter (5.3.2). Since conveying research protocols and data, as well methodologies from two or more disciplines does not come without frictions, I discuss, in the following, some aspects relating to these issues, with regard to my own research in section 5.3.3.

5.3.1. Conceptual limitations

Another important source of concern when working with these new tools is that the constructs that these new devices aim to study are complex and multifaceted; stress, emotion, feelings and affect are not univocal concepts, across and within disciplines. This is one major limitation of my study (in addition to those presented in the third article, sect. 4.2.5). Stress is an interesting candidate for understanding the entanglement of biology and environment (Rose et al. 2021) and an interesting candidate to explain the pathways and mechanisms that link urban living and psychosis (Rose, 2020). However, there are numerous problems with the way stress and (urban) stressors are defined and operationalised (Birk, 2021). The way I approach stress in this research is no exception. I operationalised physiological arousal through skin conductance level, which can be understood as an index or a biomarker for stress. I am aware that this is far from being the only way to study biological expressions of stress. In addition, I approach stress through the declarative mode of expressed feelings and emotions, but without working with established questionnaires, such as the perceived stress scale (Cohen et al., 1983) that is largely used in psychology. This is due to the *in situ* methodological stance taken within the research. While these aspects certainly expose real limitations, my approach is a starting point, an experimentation in the development of new approaches to (urban) mental health. This is reflected, I think, in the *bricolage* approach that underpins my work. I join here de Freitas, who states that “rather than dismiss EDA [skin conductance] as irrelevant or insignificant, or serving only to individualize and pathologize […], I want to trouble the all too easy antibiologism of social theory” (2018, p. 297).

Engagement between social theory and biology is precisely what has been advocated in two recently proposed frameworks in the fields of (i) mental health and (ii) city wellbeing. First, in the pursuit of the idea and wish to revitalise the relationship between sociology – and more

broadly the social sciences – and the life sciences (see Fitzgerald et al., 2016), Rose, Birk and Manning (2021) propose "neuroecosociality" as a new model for the study of mental health:

> How can we grasp the 'causal architecture' (Keyes and Galea, 2017), or the 'mechanisms' (Manning, 2019), through which ecosocial experiences are embodied? We need to go beyond the broad correlations of social epidemiology to focus on the actual experiences of those who live their lives in those adverse circumstances that have been identified as social determinants – poverty, poor housing, pollution, financial stress, domestic abuse, racism, stigma, trauma. These are not raw individual experiences; experience always arises out of encounters in a shared social and material world suffused by affects, meanings and memories. Nor are they static; for humans, both past and future, are present in the experience of the present. (Rose et al., 2021, p. 3-4).

This can be achieved is by bringing "the growing socio-theoretical literature on embodiment and materiality in contact with critically evaluated neuroscientific research on pathways and process" (Rose et al., 2021, p. 12). Second, with a more explicit focus on the city and anchored in geography rather that sociology, Pykett, Osborne and Resch (2020) propose "critical neurogeography" as a novel conceptual framework for the emerging field they call "neurourbanism", understood as studies that address urban problems and wellbeing in cities by using methods originating from neuroscientific laboratory research:

> By advancing a geographical focus on the brain in its social milieu, the framework of critical neurogeography foregrounds a relational account of space. It challenges us to consider the partiality of approaches that overlocalize complex and diverse social experiences of stress within neural mechanisms. (Pykett, Osborne & Resch, 2020, p. 1942)

This leads me to highlight another significant limitation of my approach, that I briefly evoked in the second and third article of the dissertation. Both neuroecosociality and critical neurogeography understand the entanglement of (urban) environment, socio-economic factors and (mental) health as a biosocial relationship that exceeds the immediate encounter of persons with their environment. These perspectives foreground a relational conceptualisation of space across varying levels; from the proximate environment to the wider social, economic and political context, from personal to collective experiences, from the past (through memories) to the present and the future (through expectations). This ambition contrasts with my approach, partly for practical reason (it is extremely difficult to account for all these various scales at the same time), but also for conceptual reasons. The conceptual framework I elaborated for the purpose of this study is focused on the immediate and proximate encounter of a person with his or her environment. This stems especially from the notion of *ambiance urbaine* which is deeply anchored in a perceptual approach to a specific urban situation. Therefore, the scale at which I worked remained the proximate spatial context in which participants evolved. As a result, my focus is limited on the immediate encounter with urban environments, although I think elements from my data – if reinspected and analysed – could provide insights into the way larger socio-economical forces that shape urban experiences and urban stress. I further discuss this aspect in the last section, where I discuss future research trajectories.

5.3.2. Affect, emotion, geography and biosensing; any contradiction?

The theoretical framework developed around the notions of affective atmospheres and *ambiance urbaine* on the one side, and the methodology that incorporates psychophysiological

measure of the autonomic nervous system on the other is an endeavour to bring together two apparently different – or even opposed – conceptions of emotional and affective processes. This is at core of the biosocial proposition held in this thesis. While not incompatible, as it has been highlighted in the first article, these two traditions rely on different understandings of what emotion and affect are. The notions of affective atmospheres and *ambiance urbaine* arise and draw on appraisals of affect and emotion within geography, while measuring skin conductance is anchored in affective science. It is therefore important to discuss the epistemological tensions arising from such initiative. To do so, I briefly discuss here the two dissimilar conceptualizations of emotion and affect, whilst I cannot do full justice to the ongoing rich debates around these concepts. It is argued here that geographical conceptualisation of emotions and affect downplays the biology and biochemistry of the body, and that, on the opposite, these processes are central in affective sciences, where the social, cultural and political dimensions are less considered (Osborne, 2019)[50]. I then reiterate the way these approaches can be joined (even if not seamlessly) and conclude in inscribing these difficulties in the wider context of interdisciplinary research.

The rise of the importance of emotions and affect in geography is often traced back to Anderson and Smith's editorial paper entitled "emotional geographies", published in 2001 in the journal *Transactions*. The authors, in response to the marginalization of emotions they perceive in social sciences, call for an increased attention to the ways in "which the human world is constructed and lived through the emotions" Anderson and Smith, 2001, p. 7). Geographers rapidly embarked on the 'feelings and emotion' route, to explore the ways in "which [they] make the world as we know and live it (Anderson and Smith, 2001, p. 9). As a result, scholars engaged not only on various and ever-expanding terrains of investigation, but also adopted different and changing positions with regard to what emotions and affects are (Pile, 2010), and, as a result '[i]t can be hard to grasp exactly what the conceptual underpinnings of this burgeoning field are' (Pile, 2010, p. 5).

I follow here the two-part distinction that is often made within geography for the sake of clarity, between emotional geography and affective geography. Anderson and Smith invite us to think of emotions as "ways on knowing, being and doing" (2001, p. 3). While initial conceptualization of emotions, drawing on humanistic geography, heavily relied on individual subjectivity (Pile, 2010; Rohse et al. 2020), this scope has been expanded. Thus, emotional geography seeks "to understand emotion – experientially and conceptually – in terms of its socio-spatial mediation and articulation rather than as entirely interiorised subjective mental states" (Bondi et al., 2016, p. 3). As such, emotional geography is concerned with examining the situated mediations between people, knowledge, being, behavior and place. They are not reducible to a person, but always relational, although they are experienced and expressed on an individual level:

> Emotions, thus, no longer belong exclusively to any individual – even though they are experienced and expressed this way – but are part of what we might call a psychodynamics connected to space and place. Emotions, now, lie *between* individuals, and *between* individuals and perceptual environments. (Pile, 2010, p. 13, emphasis in original).

[50] For this discussion, I draw among others on Osborne (2019), who follows a similar line of argument.

As a consequence, the way we access emotions empirically is fundamental: emotional geography relies on the expressed emotions, since "they are generally held to be nameable and describable, such that people can talk about them, albeit sometimes with difficulty" (Rohse et al., 2020, p. 137). Subjective emotional experiences are effable, since the concept of emotion "tends to emphasise cognitive processes, communication, through language, and at least by default, self-contained subjectivity" (Rohse et al., 2020, p. 138).

Conversely, with the concept of affect, geographers have developed accounts that emphasis the non-cognitive and inexpressible dimensions of such experiences. This conceptualization draws on Derrida's deconstruction of language and on (Massumi's reading of) Deleuze's readings of Spinoza's *Ethics* to propose *affect* as being interpersonal (and not contained within an individual), beyond cognition, and thus fundamentally ineffable (Pile 2010). Non-representational theory, approaches and methods are at the forefront of such conceptualization within geography, which marks an important conceptual break with the way emotions are seized in emotional geography:

> This difference turns on the representability of emotions and affects. There is potential for disagreement here, as emotional geography emphasises the significance of expressed emotions while non-representational theory emphasises the importance of inexpressible affects. (Pile, 2010, p. 7, emphasis in original).

The difference, as pointed by Pile (2010), resides in the location and representability of emotion and affect; while emotions are localizable in personal experiences and able to be put in words or other forms of representation, affect is not. In line with such conceptualization, affect is beyond cognition, always interpersonal and cannot be known, grasped, measured, expressed or represented (McCormack, 2003; Pile, 2010; Seigworth & Gregg, 2010, O'Grady, 2018). This separation of emotion and affect is also questioned within geography, based on the argument that emotions are not accessible straightforwardly through language and verbalization (Bondi, 2005).

The body is a crucial determinant in affective and emotional geography, since it is considered as the site of knowledge, as "the 'authentic' location of affect/emotions" and the "location from which one experience and speaks" (Pile, 2010, p. 11), in both of these research strands. However, the two apprehension of the body differ: it is "a shared ground that is not actually shared" (Pile, 2010, p. 10) between emotional and affective geographies:

> So, both emotional and affectual geography take the body seriously, but not in the same way. Both acknowledge the social production of the body, yet in ways that tend to universalise the body – either by valorising the personal that lies beyond the social, or by assuming a transpersonal non-human that lies beyond the production of humanness. (Pile, 2010, p. 11)

Moreover, both non-representational theories of affect and emotional geography foreground the body, as the site of validation of knowledge, but both move away from a biological understanding of the body: while emotion and affect are multifaceted concepts within each of these research strands, emotional and affective geographies are little concerned with the biology, the biochemistry and the fleshiness of the body. This however, is central to another conception of affect and emotion, in which biosensing and skin conductance is rooted.

In the biological and affective sciences, affect and emotions are understood in a very different way, putting emphasis on the biological body, in that they are interested above all in the somatic and biochemical processes linked to emotions and affect. In such an approach – also called the organismic approach (Osborne, 2019) – although there are various theories of emotions here too (see for example Kreibig, 2010 and Marsella et al. 2010), "there seems to be the common understanding that emotional states are characterized by physiological and cognitive responses to clearly identifiable stimuli" (Gatti et al., 2018). There is an agreement that emotions have biochemical underpinnings and are "causally constituted by neurological processes" (Feldman-Barett et al., 2007, p. 373), before they emerge at the level of consciousness. Physiology and physiological processes are central in such conception of emotions, although the specificities of their pathways, actions and association with particular emotions is contested:

> When asked to define emotions, most researchers will include physiological terms. However, accounts disagree on the importance and nature of physiological changes associated with different emotions. Whether or not emotions are characterized by unique physiological changes (i.e., emotion-specific physiological response patterns) has been fervidly debated since the 19th century. Currently the predominant opinion is that somatovisceral and central nervous responses associated with an emotion serve to prepare situationally adaptive behavioral responses. (Pace-shott et al., 2019, p. 270).

As a result, emotional experience is closely related to these bio-physiological processes. Affective sciences, which build on such organismic approach, locate emotions above all within the biological body, in the fleshiness of the bodies that is precisely put aside by emotional and affective geographies. Therefore, while affect in geography is considered as ineffable, not graspable, organismic approaches of affect and emotion precisely propose to do so. Moreover "the organismic approach is asocial and assumes that all emotion is inherent and derives from inside the biological body" (Osborne, 2019, p. 32), and in doing so, it leaves aside the relational, socio-cultural and political aspects of emotions.

It is then easy to see the potential inconsistency between these two approaches, that are combined in the present study. Hence the potential for disagreement and/or contradiction, between the conceptual and the methodological framework of my study. However, if these conceptions of emotions and affect are fundamentally different, or might even be seen as opposed, they are not incommensurable. As it has been argued in the first paper, there is space for connections, allowing for a biosocial approach such as the one proposed here to emerge, in order to push forward our geographical understanding of the relation between emotion and environment, between health and place:

> Attention to biology has the potential to illuminate mechanisms through which socioeconomic, demographic, and psychosocial factors shape human development and health within the contexts of everyday life. (Harris and McDade, 2018, p. 3).

The three-layered conception of affect, feeling and emotion discussed in the first article allows a tentative jointure of these apparently opposed views. The body-mind layer-cake model proposed by Pile, drawing on Ben Anderson's work (2006), is structured as follows:

> Layer 1: the non-cognitive – affect is the deepest layer, below, behind and beyond both pre-cognition and cognition. As these are non-cognitive, they are non-psychological, in that

> they never become psychological objects. Affects reside in bodies, plural: they are not simply a bodily content or capacity, affect refers to flows (of affect) between bodies.
>
> Layer 2: the pre-cognitive – feelings lie between affects and emotion, but they are not yet expressed or nameable, remaining tacit and intuitive. Nevertheless, feelings can emerge into consciousness. These are distinctly personal, as feelings are the emergent patterns that derive from heterogeneous flows of affect through bodies. Feelings are a response, therefore, to transpersonal affects and cannot be said, then, to be contiguous with the individual, even while they are personally experienced.
>
> Layer 3: the cognitive – emotions are expressed feelings, being both conscious and experienced. Although emotions emerge from feelings, and represent personal experience, they are socially constructed, through language and other representational practices.
>
> (Pile, 2010, p. 9.)

This model may not be flawless – it has indeed received many critiques as Pile himself highlights in a reply (Pile, 2011) –, but it allows to "see where knowledge from the organismic approach to emotion could be placed in the diverse spread of emotional work in geography" (Osborne, 2019, p. 32), namely within the second layer. If affectual geographies are concerned with the first layer – the non-cognitive – and emotional geographies with the third – the cognitive – then, as I argued in the first article (chapter 2.5) the organismic approach and the biosensing techniques find their place in the pre-cognitive layer highlighted by Pile (2010).

In this conception it is considered that the differences between affect, feelings and emotion lie at the level of consciousness at which they occur, where "[a]ffect, sensation [or feeling] and emotion thus occupy different points on a continuum going from body to mind, each having a different temporality" (Labanyi, 2010, p. 224)[51]. As discussed above, affect, within geography is understood as lying always outside of representation: either it is outside of consciousness and therefore not able to be put into words, or it is no more *affect*[52]. However, the idea of a *registration* of affect in bodies is present in Massumi's understanding, as he qualifies affect as *intensities,* which can be registered in the physiology of human bodies, and measured through heart rate fluctuation or respiratory system activity (2002), and Wetherell argues that Anderson "seems to include autonomic bodily responses registering that something affecting has happened such as the heat of a blush, the tension of an angry body, and so on" (2012, p. 66) at the second level of his layer cake model. Besides, Brennan, who is interested in how affect circulate, considers the transmission of affect as being of atmospheric nature, with social or psychological origins, and physiological or biological implications:

> In other words, the transmission of affect, if only for an instant, alters the biochemistry and neurology of the subject. The 'atmosphere' or the environment literally gets into the individual. (Brennan, 2004, p. 1)

Therefore, if affect itself is ineffable and outside of representation, its *registration* in sensing bodies seems to be graspable. As a consequence, it is argued here that the unconscious and involuntary bodily reactions assessed by biosensing can be linked to affect, or more precisely to the registration of affect in bodies. This connects with the affective dimensions of the concept affective atmospheres, understood as "something distributed yet palpable, a quality of

[51] For a critical lecture of such duality between affect/emotion and between body/mind, see Leys (2011, 2017)

[52] Features of this paragraph appear in the first article of the thesis, section 2.5.

environmental immersion that registers in and through sensing bodies while also remaining diffuse, in the air, ethereal" (McCormack, 2008, p. 413). I am aware that this is not the only way to foster an empirical approach to affect and affective atmosphere, and moreover, I do not claim that this is a way to quantify affect in itself, but rather a way to capture how a body is affected by environment, at a level not (yet) registered and mediated by consciousness, as highlighted previously.

The discussion held so far on the various interpretations, definitions and conceptualization of affect, emotion, the way the two relate to one another and their accordance/discordance with biosensing techniques is symptomatic of broader issues when working at the fringes of, or across disciplinary boundaries. The contrasting acceptations of affect and emotion discussed in this section relate, within the realm of medical and health domain in which my research falls, to wider tensions and differences between dominant epistemologies in the medical and the social sciences. At the risk of overstating, but for the sake of the argument and although there are exceptions, it is probably fair to say that a biomedical paradigm prevails in the medical sciences, and that such approach is characterized by its tendency to individualize and biologize health and illness. As a consequence, individual level measurements and intervention are privileged in biomedicine and conventional approaches to health (Golden and Wendel, 2020). The organismic approach of affect and emotion emerges within such conception, in that the wider environment is, for a great part set aside. On the other end, and there are exceptions here as well too, the social sciences tend to socialize health and illness, in that they tend to adopt socio-ecological models of health, that steer away from the individualizing and naturalistic acceptations, and foster concepts such as 'root causes' and 'social determinants of health' (Golden and Wendel, 2020)[53]. While the first approach is inherently turned inwards, exploring the biological body in the search of causes of illness, the latter is intrinsically turned outwards, attentive to the environment in which this body is inscribed. The biosocial approach proposed here is infused by and contributes to broaden the spectrum of interdisciplinary work, across the social and biological sciences, across those epistemologies. To do so, methodological experimentation has been suggested as means to explore the interstices between the biological and the social (Callard and Fitzgerald, 2015).

The methodology adopted in my approach is grounded on such methodological experimentation[54]. The availability of new technologies and sensors gave birth to a swelling wave of research that make use of these new devices in their investigations, and I obviously include myself here. In the context of (mental) health research, these newly available devices take form in a variety of different sensors, technologies and practices, that are loosely "connected around the ambition of harnessing the data generated by digital technologies to both predict and monitor mental ill health" (Birk et al., 2021, p. 1). As such, digital phenotyping is considered by some as holding the promise of a better, quicker and more fine-grained identification of people suffering from a specific disease or mental distress, and holds the promise of delivering better and individually tailored treatment. Within psychiatry, it has been

[53] The various and evolving acceptations of mental health in psychiatry and public, swinging back and forth between these two positions is discussed in section 2.3.6

[54] See section 3.6.1 for a detailed discussion of my research process, framed with the notion of *bricolage*.

suggested that digital technologies may (i) fill the absence of 'objective, continuous, ecological measurements of emotion, cognition, and behaviour' (Hirschitt & Insel, 2018) that have been suggested as being crucial for improving mental health care; (ii) facilitate access to mental health services; (iii) minimize reluctance to seek care; and (iv) provide a better overview of a fragmented health care system (Hirschitt & Insel, 2018). Similar arguments have been advanced for early psychosis more specifically, where digital health technologies could potentially improve care "by better accounting for clinical heterogeneity, offering better predictive models, increasing access to early interventions and enhancing existing treatment options" (Torous et al. 2019, p.1). Concurrently, the rapid growth of digital phenotyping and biosensing methods raises ethical, methodological, epistemological and conceptual questions that scholars have only just started to explore. In the following, I first discuss my own approach with respect to the debate on the risk of individualising mental disorders that these approaches raise. Second, I position my study in relation to the discussion on the indefinite and complex character of the concepts that these tools engage.

5.3.3. Biosensing, subjectivity and the collective

A major concern about the data produced by digital phenotyping and biosensing is that these new devices are not neutral in terms of imbedded economic and moral values (Birk et al. 2021), and that these new forms of research implicate novel alliances and tensions between researchers, private technological companies, research 'subjects' and more global institutional and governmental structures (Pykett et al., 2020). As such they raise questions about data ownership, the risk of intrusion by private companies who have access to the data, and the uneven distribution of economic value of the generated data. Moreover, individualisation, combined to the biological features monitored by a great part of these devices, runs the risk of objectifying diagnoses and treatment, which raises the question of the place for the experiences, agency and subjectivity, and thus relates more broadly to the wider critique of power within psychiatry. Within psychiatry, the importance of acknowledging subjective experiences of patients as valuable and crucial contribution to the understanding of mental ill health gained importance towards the end of the 20th century, and became more widely accepted and recognized since:

> From a clinical perspective focusing on subjective experience offers a window into the uniqueness of each individual's personal recovery narrative in conjunction with his or her strengths, weaknessess, wishes, activities and preferences. The personal meanings each person attributes to his or her illness within his or her life context is what constitutes the individual's recovery process. By actively emphasizing the human context of subjective experience the clinician can most effectively understand and facilitate the process of a rediscovery of agency, sense of self, preferences and personal goals. […]. In terms of research, acknowledging that people are not only "disorders," but rather these disorders are experienced by persons living and coping with them, implies that we cannot study the disorder in isolation from the person who is experiencing it. Appreciating the importance of subjective experience requires then a step towards shifting research to integrate qualitative approaches. (Roe & Lachman, 2005, p. 227).

However, as argued in the second article (chapter 3.2), psychiatric research, has for a long time been confined to the restriction of research institutional sites, such as medical offices and clinics. *In situ* approaches have a longer research tradition in social sciences interested in mental

health, where geographers (e.g. Parr 2008) and anthropologists (e.g. Estroff, 1986; Knowles 2000). In this vein, ethnography has been put to use increasingly in recent years in the social sciences in order to develop more fine-grained approaches to the entanglement of urban environment and mental health states, on various levels (Söderström et al., 2016, 2017; Bister et al., 2016, Codeluppi, 2019, Richaud & Amin 2020, Amin & Richaud 2020, Bieler & Newhöner, 2018; 2019; Bieler, 2021). This method of approach to the city-mental health nexus rejects the idea "assuming that people's subjectivities are somehow singular, autonomous and/or fixed" (Pile, 20018, p. 211). Instead, it is underpinned by a conception of subjectivity as situated in specific contexts, emerging in the coalescence of both human and non-human entities. Such research investigates the dynamic interplay between environment and subjectivity, or, in other words how "how subject formation (literally) takes place" (Pile, 2008, p. 208) in and through urban environments. What is explored here, is how the city – the experience of and engagement with it – is involved in the crafting of the sense of self and the shaping of the sum of "inner life processes and affective states" (Biehl et al., 2007, cited in Richaud & Amin, 2019). This leads Richaud and Amin to question the very concept of 'mental health' in their investigation:

> To frame our inquiries in terms of 'subjectivity' rather than 'mental health' more suitably acknowledges the open-endedness of affective and psychological states arising out of the constant interplay between escalations of exhaustion, anxiety or stress, and slowing-down processes, mediated by the ways in which the city is inhabited and in turn inhabits the subjects (Richaud & Amin, 2019, p. 13)

Thus, Amin and Richaud (2019) seek to be attentive to the formation of mental states through the lived experiences of situated and contextualized urban environments, and suggest to foreground the 'self-environment nexus' in their understanding of the relation between mental health and cities. The study carried out in the doctoral research builds on such *in situ* and ethnographic approaches, however, it proposes a specific and distinct angle in that it mobilizes biosensing technologies. This raises the question of the place given to the participant's subjectivity.

It has been argued that biosensing techniques run the risk of stripping the participants of their subjectivity, because it captures bodily and/or biological characteristics and reduces them to quantified abstracts (Lupton, 2016; Birk et al., 2021; Rose & Fitzerald, 2022). As a matter of fact, Rose and Fitzgerald express such reticence in commenting the second paper of the present manuscript in their recent book, *The Urban Brain: Mental Health in the Vital City* (2022; see p. 209). Deborah Lupton thus rightfully calls to question "what […] the implications for subjectivities and embodiment in the world of m-health [are]" (2012, p. 241 Skin conductance, the technique used here has indeed a long laboratory research history in research on psychosis, where, together with other physiological measures, it has been deployed to study disordered biological processes that are associated with a diagnosis of schizophrenia and other psychoses, either in a causal way, are as a result from the condition. For example, 'abnormality' in various skin conductance parameters have been explored in the search for a bio- or vulnerability marker (for a review see Shell et al., 2002). Here the body becomes what Lupton depicts as a "complex information system" (Lupton, 2012, p. 233) that researcher access and tap into with sensors and other technological devices, without considering the person itself, without considering her or

his subjectivity. As it has been made clear throughout the manuscript and especially in the methodological framework, the present research does convene physiological data, but only together with the narratives of the participants, which provide rich accounts of their felt and lived experiences. However, the ethnographic dimension, and hence the attention to the participant's subjectivity is perhaps a bit less deep when compared to the ethnographic pieces mentioned. This can be linked to the interdisciplinary methodological set up of the study, which falls somewhere between the lab and research in real life context.

The above-mentioned critique relates to the more general concern that digital phenotyping and biosensing involve the risk of emphasizing "individualised understandings of mental distress, seeing this as both innate to a person and inherently pathological" (Birk et al., 2021, p. 3), which goes against the grain of the socio-ecological paradigm prevailing in social sciences mentioned above. Thus, the technique used to collect data, the monitoring of the skin conductance, raises questions precisely about the epistemological tension discussed above:

> Can digital phenotyping fit into the wider landscape of mental healthcare, and its growing recognition of the value of subjective meaning to person-centred care and recovery? (Birk et al., 2021, p. 2)

I share such scepticism. However, the way I implemented my methodological approach, combined with the underpinning questions and approach that support my research allows me to relate to the conceptualisation of skin conductance data as "worldly sensibility", as suggested by de Freitas (2018), who reclaims skin conductance data as fundamentally environmental:

> I argue that electro-dermal digital data [also called skin conductance] belong to the charged […] environment, and that we must find ways of framing the data in terms of the dynamic fluctuations and entanglements of that environment. (de Freitas, 2018, p. 294).

This relates to the question of how we can render biosensing technologies more social. Such an approach challenges the idea that the skin conductance data belongs to an individuated body, or even that the body is the unit of inquiry (de Freitas, 2018). Rather it foregrounds the idea of an in-betweenness, of an interaction between an environment – or an *ambiance* and *affective atmosphere* as I framed it – and the person. Thus, I integrated physiological data in order to 'detect activity below the perceptual threshold of the human' (de Freitas, 2018, p. 299) and as a means to work towards 'the provisional ground of embodiment, but also the distributed and differential nature of individuation' (de Freitas, 2018, p. 299), without sidestepping experience and subjectivity. The approach I am advocating for here is to work on the identification of external, environmental and social factors implicated in the advent of stress and/or wellbeing, building partly, but not only, on physiological indices of stress. In doing so, the objective remains to work on the inputs that are 'absorbed' by the participants, rather the way these are processed by the bodies of the participants. With skin conductance, we remain on the surface of what is traditionally understood as separating the biological from the social – the skin – while acknowledging and building on its porosity.

5.4. Further research trajectories

As it has been made clear throughout the dissertation, we find ourselves today at a turning point in research on (urban) mental health, where new epistemological approaches are proposed, innovative (biosocial) methods are experimented and tested, and new alliances between disciplines are explored to work towards identifying the mechanisms that link urban living to psychosis and other mental disorders. Considerably more work will need to be done to determine those pathways. In this last section, I move on to suggest future research trajectories, based on the results and limits of my study. I discuss the need to integrate broader socioeconomic and political forces, connect to the current situation we live due to the Covid-19 pandemic and suggest that future investigations should not be fixated on the deleterious effect of urban living, but also pursue research on the ways urban situations may represent helpful resources in a process of recovery.

As discussed above, my approach is limited in the way I took into account larger socio-political and economic factors. However, "from a relational perspective, it is not possible to isolate the place-specific components of urban stress without appreciating the wider social, economic, cultural and environmental context in which space is produced (Pykett, Osborne & Resch, 2020, p. 1942-43). Pykett and her colleagues (2020) consider that, today, urban stress must be considered as an expression of the capitalist economic system and the social organisation induced by capitalist relations (Pykett, Osborne & Resch, 2020). The question then is, how can we account for this impact? As highlighted in the research framework, geographers have long been interested in these wider socio-economic and political forces when studying mental health issues. However, in their focus on urban experience and urban stress, these aspects have been sidestepped a little bit, to the benefit of a more finetuned attention towards the immediate surroundings of urban dwellers. While geographers had the tendency to stick closer to the immediate environment in their investigations of urban stress (Söderström et al., 2016), anthropologists and sociologists recently sought to capture these wider dynamics. Through ethnographic approaches, Berlin-based anthropologists suggested the concept of "niching" to describe the progressive process of reappropriation of urban space by persons living with psychosis, and how they arrange affective and environmental conditions of recovery (Bieler & Klausner 2019; Bister et al. 2016). Bieler in particular, through 'co-laborative' long-term ethnographic inquiry with mental health service users, studied the transformations in the Berlin housing market and their effect on community psychiatric care (2021, p. 46).

In a similar vein, Rose et al. (2021) studied the entanglement of mental health, migration and megacities in Shanghai, uncovering the "ways that different generations of migrants actively create liveable niches – not just particular locations, but also practices of small-scale sociality and self-techniques to manage their stresses and sustain their aspirations, despite the inescapable precariousness of their situations" (Rose et al., 2021, p. 13) It appears that these wider contexts undoubtably shape our experiences of local places and of daily-life; thus the study of urban stress has much to gain if we integrate these forces in our investigations. Moreover, it would be of interest to pursue work using biosensing and/or digital phenotyping approaches in mental health geography, with the ambition of integrating these broader social, political, economic and cultural dynamics. In other words, future research could usefully

explore how psychophysiological stress relates not only to the immediate encounter of people living with early psychosis and, but also to the wider context in which these situated events take place. In addition, we should find ways to work on the biosocial embodiment of these phenomena over longer periods of time, in order to grasp how these adverse and/or stressful living conditions could eventually lead to mental health issues.

Closely related to the topic discussed above and very much anchored in current events, the relation between (urban) stress, mental health and the Covid-19 pandemic is yet another important matter for future research. The pandemic had and still has significant impact on our daily lives: our mobility and movement are restricted, our social contacts limited, our working environments have been profoundly redefined through work-from-home measures and/or (temporary) unemployment, to name but a few consequences of the pandemic. Although we have only had limited time to evaluate the consequences of a phenomenon that is still unfolding before our eyes, it appears that the Covid-19 pandemic adversely affects mental health, especially that of vulnerable persons (Hurst et al., 2020; Taquet et al., 2020), through various channels, whether it is by actually contracting the virus, the fear of contagion or the restrictive measures implemented to limit the spreading of the virus (de Quervain et al. 2021). With regard to psychosis, a recent retrospective cohort study highlights that the "rate of first or relapsed psychotic disorder diagnosis after COVID-19 diagnosis was […] substantially higher than that for all control health events" (Taquet et al., 2021, p. 137). However, the same study found no clear sign for newly diagnosed psychotic disorders in the 14 to 90 days following a Covid 19 diagnosis, although case reports suggest that this occurs (Taquet et al., 2021). This indicates that a diagnosis of Covid-19 may provoke a relapse of psychosis, rather than trigger a first episode. As a matter of fact, relapse in psychosis has been reported to be associated with quarantine in a case report (Sanchez-Alonso, 2020). The effect of quarantines and other consequences of the pandemic were not on the radar of the above-mentioned study. Concurrently, "having a diagnosis of psychiatric disorder [comprising anxiety, mood and psychotic disorders] in the year before the COVID-19 outbreak was associated with a 65% increased risk of COVID-19" (Taquet et al., 2021, p. 138), which highlights a bi-directional association between mental disorders and Covid-19.

As discussed in the methodological chapter, the Covid-19 pandemic troubled my research process. I was about to start fieldwork when the pandemic hit Europe and Switzerland. While I took care to include the topic in my discussions with the participants, it was not the main focus of my research. Further research could investigate the impact of the Covid-19 pandemic, with regard to the urban psychosis-nexus. Crises can appear as exacerbators of certain pressures and tensions. The term 'shadow pandemic' (United Nation Woman, n.d.) has been coined recently to point out how the Covid-19 pandemic amplifies gender inequalities, as highlighted by a United Nations report about the indirect impact of the pandemic on women (United Nations Woman, 2020). More generally, it appears that the "pandemic is deepening pre-existing inequalities, exposing vulnerabilities in social, political and economic systems which are in turn amplifying the impacts of the pandemic" (United Nations Woman, 2020, p. 2). As highlighted above, this is the case for mental health and psychosis as well. Thus, the Covid-19 pandemic might represent an opportunity to better grasp some of the issues at stake in the relation between urban environment and psychosis. However, we need to be very cautious here not to take

advantage of persons who are already vulnerable, in a situation that potentially increases their vulnerability even more.

Finally, in the research framework, I highlighted that health geography today was more oriented towards well-being, and the deleterious and/or restorative effect of built urban environment has received less attention (for an exception see Hedblom, 2019; White & Shah, 2019). Philo sees the reason for this stance in the 'posthuman' turn in geography, which he argues emphasises the "'good' and 'for the good'" (Philo, 2017, p. 257). As a result, he called for a 'less than human geography' that rebalances this focus, and that foregrounds an

> approach to the study of worldly human geographies confronting foursquare *not* what enhances the human, distributes it, grows its capacities, amplifying its affective reach and involvement, adding to the human in a manner that enchants, enthrals, enlivens. But, rather, it would be an approach alert to what diminishes the human, cribs and confines it, curtails or destroys its capacities, silencing its affective grip, banishing its involvements: not what renders it lively, but what cuts away at that life, to the point of, including and maybe beyond death. It is to ask instead about what *subtracts* from the human in the picture, what disenchants, repels, repulses – what takes away, chips away, physically and psychologically, to leave the rags-and-bones (and quite likely broken hearts, minds, souls, spirits) of 'bare life'. (Philo, 2017, p. 247-8)

I focused my study on the deleterious and harmful effects of urban environments, seeking to identify elements of that environment that elicit stress in persons living with early psychosis and, with the underpinning idea that urban stress contributes to their ill-health. Here, in this final section, I would like to operate a backward swing, opening research avenues that emphasise the potential positive effects of urban environments in recovery processes, despite the fact that urban living has been identified as a risk factor for psychosis. This is important because such 'positive' approaches are yet underrepresented in psychiatry. Integrating the perspective of the patients through qualitative and ethnographic approaches is fundamental in these recovery-oriented studies and, in recent years, human geographers and social anthropologists have started to pave the way. The concept of 'niching' I mentioned above has been proposed to explore the dynamics of dwelling and rendering habitable urban environments for persons diagnosed with mental disorders (Bister et al. 2016). Söderström et al. (2017) highlighted tactics that patients with a first episode of psychosis put in place to navigate the city. Duff explored the role of 'enabling places' (2012) and 'atmospheres of recovery' (2016) as supportive places in the process of recovery from various psychiatric disorders, working with patients. Codeluppi explored the temporalities and spatialities of such recovery dynamics in the broader context of a mid-sized city in Switzerland (2019). Such ethnographic research shows the fine-grained connections between mental health and place, interrogating the dynamic and subtle interplay between urban environment, lived experience of these places and mental states. These studies "can provide helpful orientation for care professionals and service users, and provide some response to Topor and his colleagues' (2011) call for better provision of knowledge in order to empower members of recovery networks" (Söderström et al. 2017, p. 328). Thus, there is room for ethnographically informed studies to work on "recovery-oriented strategy to manage urban stress after first-episode psychosis" as suggested by Baumann and his colleagues (2019), or more broadly towards "urban remediation" (Baumann et al., 2019).

As has been made clear throughout this dissertation, such endeavours can also build on biosensing and digital phenotyping approaches, when combined with qualitative and ethnographic approaches and with the adequate precautions with regard to the risks discussed above. With regard to the results presented in this dissertation, instead on focusing on physiological arousal and stress, skin conductance could be used to explore the situations and spatialities of physiological deactivation, and explore the pouches where my participants said they could relax. This resonates with the Attention Restoration Theory (Kaplan and Kaplan, 1989) and the Stress Reduction Theory (Ulrich, 1983), which are well-known theories that highlight the exact opposite, namely, the fact that contact with nature promotes health and wellbeing. The beneficial affective and cognitive effect of contact with nature has been widely studied and is supported by empirical evidence (Laumann et al., 2003; Staats et al., 2003; van den Berg et al., 2003). All these approaches "to understanding how place relates to health are important in order to deliver effective, 'contextually sensitive' policy interventions" (Cummins et al., 2007, p. 1825), interventions that could take place at the level of cities. This concluding claim is deeply rooted in a socio-ecological conception of health.

In this regard, *Cities Thrive* is an international non-partisan international coalition that grew out of ThriveNYC, in 2015 (New York City, n.d.). The over 200 members of the coalition seek to promote mental health through prevention, raising awareness and various actions, including the creation of supporting networks, training citizens to recognize and be able to provide first aid and support for people in psychological distress and participating in urban design and planning (Söderström, 2019). For now, in Switzerland, there is not a single city that is a member of this coalition, nor does one have a mental health plan. In current times, where the Covid 19 pandemic has raised stress levels in one out of two participants of a national study in Switzerland (de Quervain et al., 2020a), such an undertaking seems timely.

However, designing healthier cities is not straightforward on the one hand, and not free from normative aspects on the other. First, the second Lancet commission[55] report insists on the fact that cities are highly complex systems, where "urban health outcomes dependent on many interactions and feedback loops, so that prediction within the planning process is fraught with difficulties and unintended consequences are common" (Rydin et al., 2012, p. 2079). Such thinking brings the commission to propose a new approach to working towards healthier cities, that foregrounds localized, context-sensitive, experimental, collaborative and interdisciplinary projects:

> First, there needs to be an emphasis on the promotion of experimentation through diverse projects and the use of trial and error to increase the understanding of how best to improve urban health outcomes in specific contexts. […] Second, […] in line with ideas of social learning, such assessment should be based on dialogue, deliberation, and discussion

[55] The Healthy Cities movement briefly discussed in section 2.3.5 was launched over more than 30 years ago to put health on the political and social agendas of cities. In 2012, a collaboration between University College London (UK) and the Lancet resulted in the second UCL Lancet Commission report (see Rydin et al., 2012), "to provide an analysis of how health outcomes can be improved through modification of the physical fabric of towns and cities and to discuss the role that urban planning can have in the delivering of health improvements" (Rydin et al., 2012, p. 2079).

> between key stakeholders rather than a technical exercise done by external experts. (Rydin et al., 2012, p. 2080).

Second, all policy-making processes, even in commonly accepted domains such as health promotion, are value-laden, since “improving health and reducing health inequalities can be in tension with one another and deciding which to prioritise is a normative decision” (Schoemaker et al. 2020, p. 1). Therefore, “If health equity concerns are to be addressed, inclusion of the full range of community representatives within such deliberation and debate is essential” (Rydin et al., 2012, p. 2079). In the light of this, it would seem unreasonable and unwarranted to suggest precise urban planning recommendations on the basis of my study, which is primarily experimental. This is however an important area of research to develop in the future, which would need a rather different approach. This is precisely what is under its way, in a collaboration between geographers from the University of Neuchâtel and psychiatrists from the Department of Psychiatry at the University Hospital in Lausanne (CHUV), in which I should be able to participate.

This new project, yet to be financed, is a continuation of a previous interdisciplinary research funded by the Swiss National Science Foundation *Understanding the relations between psychosis and urban milieus: an experience-based approach* (grant number: CR13I1_153320). The objective of this new project is to design and implement an "urban remediation" strategy. The overall aim is to promote recovery in the urban environment through an innovative strategy, designed jointly with patients, mental health professionals and local public authorities. This collaborative and transdisciplinary approach involves psychiatrists, nurses, mental health peer practitioners, patients and geographers, as well as civil society actors (shopkeepers, employees of neighbourhood institutions, public services and cultural institutions). To this end, we will set up a *living lab* in a district of the city of Lausanne, in order to identify the resources and obstacles that urban space represents in the recovery process, and, in a second step, to experiment and study the impact of creating a more supportive environment for people living with early psychosis. If this proves beneficial, we could then extend these solutions to the municipal level. It is through such collaborative approaches and local experiments that one can envisage proposing urban intervention outputs, that should strive towards rendering cities more habitable.

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7. Appendices

7.1. Appendix A

Wahrnehmung und Erfahrung von urbanen Räumen durch Personen mit einer beginnenden psychotischen Störung oder mit erhöhtem Risiko für eine solche Störung

Perception and experience of urban spaces by persons having experienced a first episode psychosis and persons with an increased risk for psychosis

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Sehr geehrte Dame, sehr geehrter Herr

Wir möchten Sie anfragen, ob Sie an unserem Forschungsprojekt teilnehmen wollen. Im Folgenden wird Ihnen das geplante Forschungsprojekt vorgestellt: zunächst in einer kurzen Zusammenfassung, anschliessend in detaillierter Ausführung.

Dieses Projekt wird organisiert durch:

Projektleitung: Marc Winz, Doktorand am Institut für Geographie an der Université de Neuchâtel (UNINE), unter Aufsicht von Herrn Prof. Ola Söderström

Sponsor: Université de Neuchâtel (UNINE)

Das Projekt wird in Zusammenarbeit mit dem BEATS Programm durchgeführt, welches von Barbara Bailey (psychologische Leitung), Jennifer Küster, (ärztliche Leitung) und Frank Heitzler (pflegerische Leitung) geleitet.

ZUSAMMENFASSUNG

Ziel des Projekts

Wir wollen mit diesem Projekt besser verstehen, wo und warum Personen mit einer ersten psychotischen Episode und Personen, bei denen Risikofaktoren vorliegen, in der Stadt Emotionen wie Unwohlsein, Erregung, Stress oder Wohlbefinden erleben.

Auswahl

Sie erhalten diese Informationsschrift, weil Sie im Rahmen des BEATS Programms betreut werden und entweder eine erste psychotische Episode erlebt haben, oder bei Ihnen Risikofaktoren vorliegen.

Allgemeine Informationen zum Projekt

Trotz einer Vielzahl von Untersuchungen, die darauf hindeuten, dass das Leben in der Stadt das Risiko einer Psychose erhöht, bleiben die genauen Mechanismen dieses Phänomens unbekannt. Uns interessiert die Frage, an welchen Orten Sie sich in der Stadt gestresst, oder unwohl fühlen, und warum dies so ist. Genauso interessiert uns, wo und warum Sie sich in der Stadt wohlfühlen. Die Identifizierung dieser Orte soll zum Verständnis des Zusammenhangs zwischen Psychose und Stadtleben beitragen.

Ablauf

In dieser Studie werden Sie gebeten, einen Stadtrundgang zu machen. Sie werden von einer Person ihrer Wahl, sowie von Projetkleiter Marc Winz begleitet. Während des Spaziergangs tragen die Teilnehmer/innen eine *Empatica E4* Armbanduhr, welche die Aktivität der Schweissdrüsen am Handgelenk misst. Dazu werden Sie sich mit Marc Winz unterhalten. Sie werden gebeten, sich über Ihr Befinden zu äussern, und zu sagen wie Sie die spezifischen Situationen wahrnehmen und erleben.

Nutzen

Sie werden persönlich keinen direkten Nutzen von der Teilnahme am Projekt haben. Die Ergebnisse der Studie können sich aber später für Menschen als wichtig erweisen, die vom gleichen Befund betroffen sind wie Sie.

Rechte

Sie entscheiden freiwillig, ob Sie an diesem Projekt teilnehmen wollen oder nicht. Ihre Entscheidung hat keinen Einfluss auf Ihre Betreuung und Sie müssen diese Entscheidung nicht begründen.

Pflichten

Wenn Sie teilnehmen, bitten wir Sie, bestimmte Anforderungen einzuhalten (z.B. Erscheinen zu den geplanten Verabredungen).

Risiken

Durch das Projekt sind Sie nur geringfügigen Risiken ausgesetzt. Der Sensor an der

Armbanduhr ist nicht invasiv, das heisst dass die Messungen ohne Verletzung der Körperoberfläche stattfinden. Der Stadtrundgang wird in einem alltäglichen Kontext durchgeführt

Ergebnisse
Bei neuen Ergebnissen während des Projekts werden Sie informiert

Vertraulichkeit von Daten

Wir erheben Ihre persönlichen und medizinischen Daten. Diese Daten werden verschlüsselt, und nur sehr wenige Projektbetreuer werden Ihre unverschlüsselten Daten sehen, und zwar ausschliesslich, um Aufgaben im Rahmen des Projekts zu erfüllen. Alle Beteiligten unterliegen der Schweigepflicht.

Die Daten können für andere Projekte weiterverwendet werden, wenn Sie Ihr separates Einverständnis dafür geben.

Rücktritt
Sie können jederzeit von dem Projekt zurücktreten und nicht mehr teilnehmen. Die bis dahin erhobenen Daten und Proben werden noch ausgewertet, bevor sie definitiv anonymisiert werden.

Aufwandsentschädigung
Sie erhalten folgende Aufwandsentschädigung: 40.—CHF

Haftung
Die Haftpflichtversicherung der Universität Neuenburg kommt für allfällige Schäden im Rahmen des Projekts auf.

Finanzierung
Das Projekt wird von der Universität Neuenburg finanziert.

Kontaktperson:
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Université de Neuchâtel
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032 718 17 93

AUSFÜHRLICHE FASSUNG

1. Ziel des Projekts

Das Hauptziel dieser Studie ist, städtische Situationen und relevante Faktoren zu identifizieren, die zur Entwicklung von Erregungsgefühlen, Stress sowie Wohlbefinden führen. Somit wollen wir mit diesem Projekt besser verstehen, *wo* und *warum* Personen mit einer ersten psychotischen Episode und Personen bei denen Risikofaktoren vorliegen, in der Stadt Unwohlsein, Erregung und Stress, sowie Wohlbefinden erleben.

2. Auswahl

Es können alle Personen teilnehmen, die im Rahmen des BEATS Programms betreut werden und entweder eine erste psychotische Episode erlebt haben, oder bei denen Risikofaktoren vorliegen. Ausserdem müssen Sie zwischen 18 und 35 Jahre alt sein.

Ihre mögliche Aufnahme in diese Studie wird im Voraus mit Ihren Betreuern vom BEATS Programm besprochen, um sicherzustellen, dass durch die Studie Ihr Wohlbefinden und ihre Pflege nicht beeinträchtigt wird.

3. Allgemeine Informationen zum Projekt

Diese Studie ist Teil einer Doktorarbeit, die von Marc Winz am Institut für Geographie an der Universität Neuenburg durchgeführt wird. Diese Arbeit erstreckt sich über 5 Jahre, von August 2016 bis August 2021. Die erste Phase des Projekts liegt bereits in der Vergangenheit und bestand darin, das Forschungsprojekt von Marc Winz aus wissenschaftlicher Sicht (Theorie, Vorgehensmethode) aufzusetzen. Die Feldforschung wird in Basel, im Herbst 2020 stattfinden. Diese Studie wird mit ungefähr 25 bis 30 Teilnehmern durchgeführt.

Trotz einer Vielzahl von Untersuchungen, die darauf hindeuten, dass das Leben in der Stadt das Risiko einer Psychose erhöht, sind die genauen Mechanismen dieses Phänomens noch unbekannt.

Uns interessiert die Frage, an welchen Orten Sie sich in der Stadt gestresst, oder unwohl fühlen, und warum dies so ist. Genauso interessiert uns, wo und warum Sie sich in der Stadt wohlfühlen.

Die Identifizierung dieser Orte soll zum Verständnis des Zusammenhangs zwischen Psychose und Stadtleben beitragen, und kann langfristig zu der Verbesserung der Betreuung der Patienten/innen beisteuern. Die Erkenntnisse unserer Studie werden dazu beitragen, die Herausforderungen und Ressourcen, die eine Stadt mit sich bringt, besser zu verstehen. Daraus können adaptive therapeutische Methoden entwickelt werden.

Wir basieren unsere Studie auf den Erfahrungen, die junge Psychose-Patienten/innen in der Stadt erlebt haben. Auch Ihnen als betroffene Teilnehmer/innen möchten wir die Möglichkeit geben, von Ihren Erfahrungen zu erzählen.

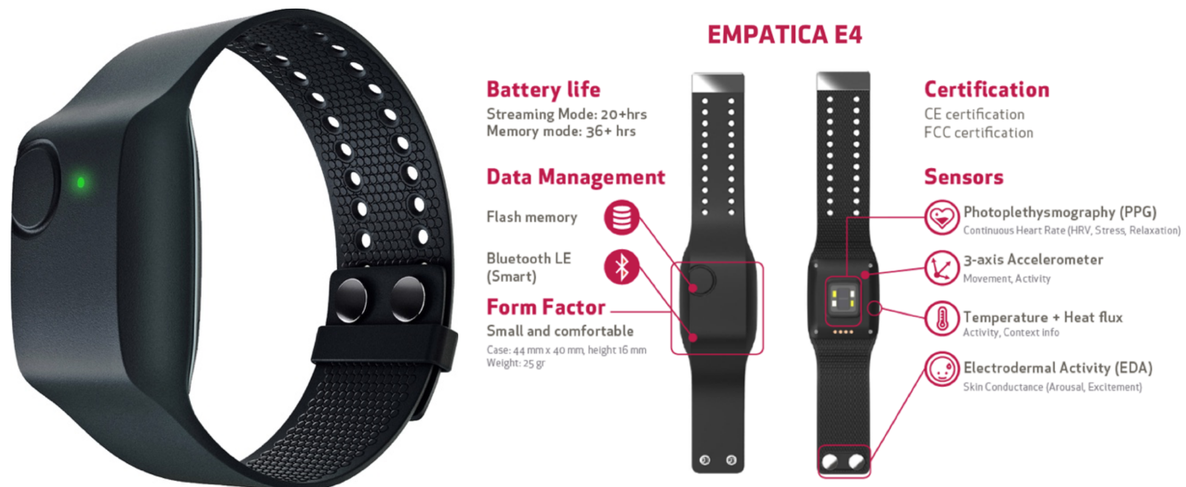
4. Ablauf

In dieser Studie werden Sie gebeten, einen Stadtrundgang zu machen. Sie werden von einer Person ihrer Wahl, sowie von Projektleiter Marc Winz begleitet. Während dem Spaziergang tragen Sie eine *Empatica E4* Armbanduhr, welche die Aktivität der Schweissdrüsen am Handgelenk misst, sowie die Hauttemperatur und den Blutvolumenpuls. Dazu werden Sie sich mit Marc Winz unterhalten. Sie werden gebeten, sich über Ihr Befinden zu äussern, und zu sagen wie Sie die spezifischen Situationen wahrnehmen und erleben. Diese Berichte werden mittels eines Aufnahmegeräts aufgezeichnet. Darüber hinaus werden die Spaziergänge filmisch begleitet, um die städtische Umgebung aufzuzeichnen. Diese Aufzeichnungen beziehen sich exklusiv auf die städtische Umgebung, und nicht auf Sie als Teilnehmer/in. Obwohl es nicht darum geht Sie als Teilnehmer/in, sondern die Umgebung zu filmen, können sowohl Sie als auch Ihre Begleitperson gelegentlich gefilmt werden. Diese Aufzeichnungen werden anonymisiert, durch Verwischung der Gesichter.

Im Hinblick auf Ihre Verfügbarkeit benötigen wir insgesamt 2 bis 3 Stunden (einmal 45 Minuten für ein Gespräch, und einmal 90 bis 120 Minuten für den Stadtrundgang, siehe Tabelle unten). Eine flexible Organisation ist durchaus möglich, um sich Ihren Bedürfnissen oder dem Tagesablauf anzupassen, wenn die Situation es erfordert.

Studien Phasen	Rekrutierung	Stadtrundgang	
Dauer	45 min.	60 - 90 min.	30 min.
Generelle Informationen (mündlich und schriftlich), Einwilligungserklärung	X		
CAPE-measure Fragebogen	X		
Aufnahmeverfahren	X		
Stadtrundgang mit Hautleitfähigkeitsmessung und Interview		X	
Diskussion und Feedback nach dem Stadtrundgang			X
Auszahlung der Aufwandsentschädigung			X

Geringfügige Schweissausbrüche werden während des ganzen Stadtrundgangs mit der *Empatica E4* Armbanduhr gemessen:



5. Nutzen

Sie werden persönlich keinen direkten Nutzen von der Teilnahme am Projekt haben. Wenn Sie bei diesem Projekt mitmachen, könnte es Ihnen aber möglicherweise helfen, die Art Ihrer Schwierigkeiten im Zusammenhang mit Ihrer Stadtwahrnehmung zu identifizieren und besser zu verstehen. Diese Aspekte werden in traditionellen psychiatrischen Interviews nicht immer berücksichtigt, und diese Studie könnte eine Gelegenheit bieten, sie weiter zu erforschen.

Darüber hinaus können sich die Ergebnisse der Studie später als wichtig für Menschen erweisen, die vom gleichen Befund betroffen sind wie Sie.

6. Rechte

Sie nehmen freiwillig teil. Wenn Sie nicht mitmachen oder später Ihre Teilnahme zurückziehen wollen, müssen Sie dies nicht begründen. Ihre medizinische Betreuung ist unabhängig von Ihrer Entscheidung gewährleistet. Sie dürfen jederzeit Fragen zur Teilnahme und zum Projekt stellen. Wenden Sie sich dazu bitte an Marc Winz (Schweizerdeutsch, beziehungsweise Deutsch sprachig): E: marc.winz@unine.ch, T: 032 718 17 93, M: 079 240 49 90.

7. Pflichten

Als Teilnehmer/in ist es notwendig, dass Sie

- Sich an die notwendigen Vorgaben und Anforderungen durch die Projektleitung halten.
- Die Projektleitung über den Verlauf der Erkrankung informieren und neue Symptome, neue Beschwerden und Änderungen in Ihrem Befinden melden.
- Die Projektleitung über die Einnahme von Medikamenten informieren.

8. Risiken

Durch das Projekt sind Sie nur geringfügigen Risiken ausgesetzt.

Die minimen Schweissausbrüche werden durch einen nicht invasiven Sensor gemessen. Der Stadtrundgang wird in einem alltäglichen Kontext durchgeführt. Während ein Teil von dem Rundgang von der Studie definiert wird, wird der andere Teil von Ihnen selbst definiert.

Sollte jedoch die Teilnahme zu starke Emotionen oder Reaktionen wecken, kann der Rundgang auf Wunsch unterbrochen oder abgebrochen werden. Die Begleiter sowie die Mitglieder des Forschungsteams stehen Ihnen während des Stadtrundgangs jederzeit zur Verfügung. Während des Stadtrundgangs stehen ebenfalls Mitglieder des BEATS Programm durchgehend per Telefon zur Verfügung.

9. Ergebnisse

Die Projektleitung wird Sie während des Projekts über alle neuen Erkenntnisse informieren, die den Nutzen oder Ihre Sicherheit und somit Ihre Einwilligung zur Teilnahme beeinflussen könnten.

10. Vertraulichkeit von Daten

Für dieses Projekt werden Ihre persönlichen und medizinischen Daten erfasst. Bei der Datenerhebung zu Studienzwecken werden jedoch alle Daten verschlüsselt. Verschlüsselung bedeutet, dass alle Bezugsdaten, die Sie identifizieren könnten (Name, Geburtsdatum, etc.) durch einen Schlüssel (Codierungsnummer) ersetzt werden. Die Schlüssel-Liste wird durchgehend in der Universität Neuenburg aufbewahrt. Genutzt wird dann nur diese Codierungsnummer, zusammen mit dem Geburtsjahr.

Nur sehr wenige Projektbetreuer werden Ihre unverschlüsselten Daten sehen, und zwar ausschliesslich, um Aufgaben im Rahmen des Projekts zu erfüllen. Diejenigen Personen, die den Schlüssel nicht kennen, können daher keine Rückschlüsse auf Ihre Person ziehen. Bei einer Publikation sind die zusammengefassten Daten daher auch nicht auf Sie als Einzelperson rückverfolgbar.

Diese Studie ist Teil einer Doktorarbeit die von Marc Winz am Institut für Geographie an der Universität Neuenburg durchgeführt wird. Diese Arbeit erstreckt sich über 5 Jahre, von August 2016 bis August 2021. Die erste Phase des Projekts liegt bereits in der Vergangenheit und bestand darin, das Forschungsprojekt von Marc Winz aus wissenschaftlicher Sicht (Theorie, Vorgehensmethode) aufzusetzen. Die Feldforschung wird in Basel, im Sommer/Herbst 2019 stattfinden. Diese Studie wird mit ungefähr 25 bis 30 Teilnehmern durchgeführt.

Die im Rahmen dieser Forschung gesammelten Daten werden in wissenschaftlichen Texten und Präsentationen (Artikel, Buchkapitel, Dissertationen, Präsentationen, usw.) verwendet werden.

Ihr Name taucht niemals in einer Publikation oder im Internet auf. Manchmal gibt es die Vorgabe von wissenschaftlichen Zeitschriften, dass Einzel-Daten (sogenannte Rohdaten) übermittelt werden müssen. Wenn Einzeldaten übermittelt werden müssen, dann sind die

Daten immer verschlüsselt und somit ebenfalls nicht zu Ihnen als Person rückverfolgbar. Alle Personen, die im Rahmen des Projekts Einsicht in Ihre Daten haben, unterliegen der Schweigepflicht. Die Vorgaben des Datenschutzes werden eingehalten und Sie als teilnehmende Person haben jederzeit das Recht auf Einsicht in Ihre Daten.

Die Daten die von der Armbanduhr gemessen werden, werden von *Empatica* verarbeitet. Empatica verarbeitet auf seinen Servern keine personenbezogenen Daten; alle gemessenen Daten sind ausschliesslich nach Ereignissen organisiert, und können somit nicht mit den Personen abgeglichen werden, die das Gerät tragen.

Die im Rahmen dieser Forschung gesammelten Daten (Schweissmessungen, Hauttemperatur, Blutvolumenpuls, Interviews und Video) könnten für zukünftige, noch nicht definierte Forschungsprojekte, sowie in wissenschaftlichen Texten und Präsentationen verwendet werden. Im Falle der Weiterverwendung dieser Daten werden alle Informationen, die zur Identifizierung der Teilnehmer/innen führen können, anonymisiert. Die verschlüsselten Daten werden 15 Jahre auf den gesicherten Servern der Universität Neuenburg aufbewahrt. Für die Weiterverwendung der Daten bitten wir Sie, ganz am Ende dieses Dokuments eine weitere Einwilligungserklärung zu unterzeichnen. Diesbezüglich behalten Sie sich das Recht vor, Ihre Einwilligung jederzeit zu widerrufen.

Möglicherweise wird dieses Projekt durch die zuständige Ethikkommission oder durch die Institution, die das Projekt veranlasst hat, überprüft. Der Projektleiter muss eventuell Ihre persönlichen und medizinischen Daten für solche Kontrollen offenlegen. Ebenso kann es sein, dass ausnahmsweise auch ein Vertreter der Versicherung Ihre Daten ansehen muss. Alle Personen die auf die Daten Zugriff haben, müssen absolute Vertraulichkeit wahren. Wir halten alle Datenschutzvorgaben ein und werden Ihren Namen weder in einer Publikation noch im Internet öffentlich machen.

11. Rücktritt

Sie können jederzeit aufhören und von dem Projekt zurücktreten, wenn Sie das wünschen. Die bis dahin erhobenen Daten und Proben werden noch verschlüsselt ausgewertet, weil das ganze Projekt sonst seinen Wert verliert. Nach der Auswertung werden Ihre Daten und Proben vollständig anonymisiert, d.h. Ihre Schlüsselzuordnung wird vernichtet, so dass danach niemand mehr erfahren kann, dass die Daten und Proben ursprünglich von Ihnen stammten.

12. Aufwandsentschädigung

Wenn Sie bei diesem Projekt bis zum Ende mitmachen, bekommen Sie dafür folgende Aufwandsentschädigung: 40.-- CHF.

Bei einem frühzeitigen Abbruch, wird ihnen Ihren Aufwand in Höhe von 10.-- CHF pro Stunde entschädigt.

Auslagen wie Reisespesen, die nur durch die Teilnahme bedingt sind, werden wir Ihnen vergüten. Es entstehen Ihnen oder Ihrer Krankenkasse keine Kosten durch die Teilnahme.

13. Haftung

Falls Sie durch das Projekt einen Schaden erleiden, haftet die Institution, die das Projekt veranlasst hat und für die Durchführung verantwortlich ist (Universität Neuenburg). Die Voraussetzungen und das Vorgehen sind gesetzlich geregelt. Wenn Sie einen Schaden melden wollen, so wenden Sie sich bitte an den Projektleiter.

14. Finanzierung

Das Projekt wird vollständig von der ausführenden Institution, der Universität Neuenburg, finanziert.

15. Kontaktperson(en)

Bei allen Unklarheiten, Befürchtungen oder Notfällen, die während des Projekts oder danach auftreten, können Sie sich jederzeit an folgende Kontaktpersonen wenden (Schweizerdeutsch, beziehungsweise Deutsch sprachig):

Marc Winz
Doktorand
Institut de Géographie
Université de Neuchâtel
Espace Tilo-Frey 1
2000 Neuchâtel
marc.winz@unine.ch

Einwilligungserklärung

Schriftliche Einwilligungserklärung zur Teilnahme an einem Studienprojekt

Bitte lesen Sie dieses Formular sorgfältig durch. Bitte fragen Sie, wenn Sie etwas nicht verstehen oder wissen möchten.

BASEC-Nummer (nach Einreichung):	2019 - 00953
Titel des Projekts (wissenschaftlich und Laiensprache):	Wahrnehmung und Erfahrung von urbanen Räumen durch Personen mit einer beginnenden psychotischen Störung oder mit erhöhtem Risiko für eine solche Störung
verantwortliche Institution (Projektleitung mit Adresse):	Université de Neuchâtel Espace Tilo-Frey 1 2000 Neuchâtel
Ort der Durchführung:	Universitäre Psychiatrische Kliniken Basel
Leiter / Leiterin des Projekts am Studienort: Name und Vorname in Druckbuchstaben:	Marc Winz
Teilnehmerin/Teilnehmer: Name und Vorname in Druckbuchstaben: Geburtsdatum:	☐ weiblich ☐ männlich

- Ich wurde von der unterzeichnenden Prüfperson mündlich und schriftlich über den Zweck, den Ablauf des Projekts, über mögliche Vor- und Nachteile sowie über eventuelle Risiken informiert.
- Ich nehme an diesem Projekt freiwillig teil und akzeptiere den Inhalt der zum oben genannten Projekt abgegebenen schriftlichen Information. Ich hatte genügend Zeit, meine Entscheidung zu treffen.
- Meine Fragen im Zusammenhang mit der Teilnahme an diesem Projekt sind mir beantwortet worden. Ich behalte die schriftliche Information und erhalte eine Kopie meiner schriftlichen Einwilligungserklärung.
- Ich bin einverstanden, dass die zuständigen Fachleute der Projektleitung/des Auftraggebers des Projekts und der für dieses Projekt zuständigen Ethikkommission zu Prüf- und

Kontrollzwecken in meine unverschlüsselten Daten Einsicht nehmen dürfen, jedoch unter strikter Einhaltung der Vertraulichkeit.

- Bei Studienergebnissen, die direkt meine Gesundheit betreffen, werde ich informiert. Wenn ich das nicht wünsche, informiere ich die Projektleitung.
- Ich weiss, dass meine gesundheitsbezogenen und persönlichen Daten (und Proben) nur in verschlüsselter Form zu Forschungszwecken **für dieses Projekt** weitergegeben werden können (auch ins Ausland).
- Ich kann jederzeit und ohne Angabe von Gründen von der Teilnahme zurücktreten, ohne dass ich deswegen Nachteile bei der weiteren medizinischen Behandlung/Betreuung habe. Die bis dahin erhobenen Daten und Proben werden für die Auswertung des Projekts noch verwendet.
- Die Haftpflichtversicherung der Universität Neuenburg kommt für allfällige Schäden auf.
- Ich bin mir bewusst, dass die in der Teilnehmerinformation genannten Pflichten einzuhalten sind. Im Interesse meiner Gesundheit kann mich der Leiter/die Leiterin jederzeit ausschliessen.

Ort, Datum	Unterschrift Teilnehmerin/Teilnehmer

Bestätigung der Prüfperson: Hiermit bestätige ich, dass ich dieser Teilnehmerin/ diesem Teilnehmer Inhalt, Bedeutung und Tragweite des Projekts erläutert habe. Ich versichere, alle im Zusammenhang mit diesem Projekt stehenden Verpflichtungen gemäss dem geltenden Recht zu erfüllen. Sollte ich zu irgendeinem Zeitpunkt während der Durchführung des Projekts von Aspekten erfahren, welche die Bereitschaft der Teilnehmer/innen zur Teilnahme an dem Projekt beeinflussen könnten, werde ich sie/ihn umgehend darüber informieren.

Ort, Datum	Name und Vorname der der informierenden Prüfperson in Druckbuchstaben Unterschrift der Prüfärztin/des Prüfarztes/der Prüfperson

Einwilligungserklärung für Weiterverwendung von Daten in verschlüsselter Form

Teilnehmerin/Teilnehmer: Name und Vorname in Druckbuchstaben: Geburtsdatum:	 ☐ weiblich ☐ männlich

Ich erlaube, dass meine Daten und Proben aus diesem Projekt in verschlüsselter Form für die medizinische Forschung weiterverwendet werden dürfen. Dies bedeutet, dass die Daten für zukünftige, noch nicht näher definierte Forschungsprojekte auf unbestimmte Zeitdauer verwendet werden dürfen. Diese Einwilligung gilt unbegrenzt.

Ich entscheide freiwillig und kann diesen Entscheid zu jedem Zeitpunkt wieder zurücknehmen. Wenn ich zurücktrete, werden meine (genetischen) Daten anonymisiert und meine Proben vernichtet. Ich informiere lediglich die Projektleitung und muss diesen Entscheid nicht begründen.

Ich habe verstanden, dass die Daten und Proben verschlüsselt sind und der Schüssel sicher aufbewahrt wird. Die Daten und Proben können im In- und Ausland an andere Daten- und Biobanken zur Analyse gesendet werden, wenn diese dieselben Standards wie in der Schweiz einhalten. Alle rechtlichen Vorgaben zum Datenschutz werden eingehalten.

Normalerweise werden alle Daten und Proben in ihrer Gesamtheit ausgewertet und die Ergebnisse zusammenfassend publiziert. Sollte sich ein für mich gesundheitlich relevantes Ergebnis ergeben, ist es möglich, dass ich über meine Prüfärztin/meinen Prüfarzt kontaktiert werde. Wenn ich das nicht wünsche, teile ich es meinem Prüfarzt/der Projektleitung mit.

Wenn Ergebnisse aus den Daten und Proben kommerzialisiert werden, habe ich keinen Anspruch auf Anteil an der kommerziellen Nutzung.

Ort, Datum	Unterschrift Teilnehmerin/Teilnehmer

Bestätigung des Prüfarztes/der Prüfperson: Hiermit bestätige ich, dass ich dieser Teilnehmerin/ diesem Teilnehmer Inhalt, Bedeutung und Tragweite der Weiterverwendung von Proben und/ oder genetischen Daten erläutert habe.

Ort, Datum	Name und Vorname der der informierenden Prüfperson in Druckbuchstaben Unterschrift der Prüfärztin/des Prüfarztes/der Prüfperson

7.2. Appendix B

Kommentierte Stadtrundgänge --- Interviewraster

Präsentation der Interviewer und ihrer Rolle(n) im Projekt. Präsentation der Forschung

Präsentation des Tagesprogramms

Heute schlage ich Ihnen vor, dass wir gemeinsam den Spaziergang durch die Stadt machen. Zuerst entscheide ich welchen Weg wir gehen (zirka 20---30 Minuten), und dann entscheiden Sie welchen Weg zurück nehmen.

Während dieses Spaziergangs tragen Sie die Armbanduhr von der wir schon gesprochen haben, die die Hautleitfähigkeit, beziehungsweise die Schweissreaktionen misst. Es wird mir einen Hinweis darauf geben, wo und wann Ihr Körper reagiert. Sie sollten nicht zu sehr auf diese Uhr achten.

Nach dem Spaziergang kommen wir zurück, und ich stelle ihnen noch einige Fragen über den Stadtrundgang und Ihr Verhältnis zur Stadt.

Ist das für Sie in Ordnung?

Das Interview wird aufgezeichnet, so dass ich dann das Material transkribieren und bearbeiten kann. Gleichzeitig trage ich selbst eine kleine Kamera, mit welcher die Stadt gefilmt wird. Dies wird es mir dann ermöglichen, das Video anzusehen und das, was Sie mir erzählen, mit dem zu verbinden, was uns in der Stadt begegnet ist. Ich werde Sie selbst aber nicht filmen.

Ich gebe Ihnen jetzt noch ein paar Anweisungen zum Stadtrundgang:

"Beschreiben Sie mir bitte die durchquerten Stadträume sowie Ihre Empfindungen (angenehm, unangenehm, Wohlbefinden, warum) mit Bezug auf Ihre Sinneswahrnehmungen (Sehen,

Hören, Riechen, Schmecken und Fühlen), der bebauten Umwelt und der Abfolge zwischen verschiedenen Räumen".

Anders gesagt, während dieses Spaziergangs bitte ich Sie, auf drei Dinge zu achten und mir zu sagen und zu beschreiben, wie Sie diese Elemente empfinden:

--- sensorische Elemente (Sehen, Hören, Riechen, Tasten). Was sehen, hören, riechen und fühlen Sie und wie kommen all diese Sachen bei Ihnen zusammen. Was ist Ihnen angenehm, oder unangenehm?

--- die Sequenzen und Übergänge zwischen verschiedenen Räumen (Betreten/Verlassen eines Gebäudes, eines Parks, Abbiegen an der Straßenecke, Betreten oder Verlassen einer belebten Hauptstraße)

--- Aspekte der bebauten Umwelt (Gebäude, Strassen, Sichtweite).

Sinneswahrnehmung

Wir wissen, dass es in der Stadt viele verschiedene Sinnesreize gibt; es gibt Geräusche, Gerüche, Sachen zum Anschauen, zum Anfassen...

1. Wie nehmen Sie diese verschiedenen Elemente wahr?
   a. Was sind die Dinge, die Sie am meisten wahrnehmen?
   b. Was sind die Dinge, die Sie stören, die für Sie problematisch sind?

2. Wie kombinieren sich bei Ihnen diese verschiedenen Sinnesreize?
   a. Wie fühlt es sich an, all diese Dinge gleichzeitig zu hören, zu sehen, zu fühlen?

3. Wie reagieren Sie auf diese unterschiedlichen Sinnesreize in der Stadt?

... Viele Patienten sagen uns, dass sie sich an manchen Stellen manchmal von diesen verschiedenen Sinnesreizen überwältigt fühlen und das gibt ihnen das Gefühl, zu viele Informationen im Kopf zu haben.

4. Haben Sie jemals diese Art von Gefühl erlebt?
5. Sind Sie in der Lage dieses Gefühl zu beschreiben?
6. Sie wissen nicht mehr, worauf Sie im städtischen Umfeld reagieren sollen, weil es zu viele Informationen gibt, die schwer zu organisieren sind?
7. Wo kommen diese Gefühle meist vor? An welchen Stellen insbesondere?
8. Ist es eher ein bestimmter Aspekt, der Sie stört (ein Geräusch, ein Geruch, ein Sichtkontakt, was Sie sehen), oder die Tatsache verschiedene Sachen gleichzeitig zu hören, zu sehen, zu fühlen?
9. Wenn Sie sich in diesen Situationen befinden, wie gehen Sie mit diesem "Überfluss" um? Was machen Sie, wenn es vorkommt?
   a. Vermeidung bestimmter Stellen
   b. Gehtempo, Pausen,
   c. Eine „Blase“ erzeugen um Schutz zu schaffen: Musik, Gedanken, Unternehmen, usw.
   d. Weg Umplanung
   e. Verwendung von Umweltobjekten zum Schutz

10. Ist dieses Gefühl des „Überlaufens“ Ihrer Meinung nach mit dem Auftreten Ihrer Gesundheitsprobleme verbunden? Oder waren diese Empfindungen bereits vor Ihren gesundheitlichen Problemen vorhanden?

Bebaute Umgebung

Ich möchte ein bisschen mehr erfahren was Sie von der Stadt und deren bebauten Teile halten.

11. Was halten Sie von diesen Gebäuden (Aussehen, Größe, Fenster, Anordnung)?
    a. Ist es unangenehm oder eher angenehm, warum?
12. Was halten Sie von der Anordnung der Straßen (Breite, Gehweg, Fußgänger, etc.)?
    a. Ist es unangenehm oder eher angenehm, warum?
13. Ist Ihnen das Sichtfeld --- weit weg sehen oder nicht sehen – wichtig? warum?
    a. Ist es unangenehm oder eher angenehm, warum?
14. Gibt es in der Stadt Situationen (Gebäude, Einkaufszentren, Kreuzungen), in denen Sie sich desorientiert fühlen? Warum?
15. Gibt es Situationen, die Ihnen zu kompliziert erscheinen, um sie zu verstehen oder um sich zurechtzufinden? Warum?
16. Wenn Sie in der Stadt unterwegs sind und zwischen mehreren Wegen wählen müssen, um zu einem bestimmten Ort zu gelangen, wie entscheiden Sie dann, welchen Weg Sie nehmen sollen?

Räumliche Übergänge

Wenn wir durch die Stadt gehen, begegnen wir verschiedenen Räumen: grosse Strassen, kleine Gassen, Parks, Plätzen, wir überqueren, Brücken, etc. Ich möchte ein bisschen mehr erfahren darüber wie Sie den Übergang zwischen diesen verschiedenen Situationen wahrnehmen

17. Wie fühlen Sie sich, wenn Sie ein Gebäude (Laden, Einkaufszentrum, Bahnhof, Verwaltungsgebäude) betreten oder verlassen?
18. und wenn Sie ein Gebäude verlassen und auf der Straße ankommen?
19. Wie fühlen Sie sich, wenn Sie einen Park betreten/verlassen?
20. Wie fühlen Sie sich wenn Sie an einer Straßenecke abbieg

7.3. Appendix C

Wahrnehmung und Erfahrung von urbanen Räumen durch Personen mit einer beginnenden psychotischen Störung oder mit erhöhtem Risiko für eine solche Störung

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PATIENTENBEFRAGUNGSRASTER

A. Können sie mir sagen, wie Sie diesen Stadtrundgang heute erlebt haben?

- **a.** Wann und wo haben Sie sich am wohlsten gefühlt? Warum?
  - **i.** Können Sie die Orte beschreiben, von denen Sie mir erzählt haben (physisch, Sinneswahrnehmungen, Gebäude, Menschen...)
  - **ii.** Welche Elemente dieser Beschreibung sind für Sie positiv? Angenehm? Beruhigend?
- **b.** Wann und wo haben Sie sich nicht wohl gefühlt? Warum?
  - **i.** Können Sie die Orte beschreiben, von denen Sie mir erzählt haben (physisch, Sinneswahrnehmungen, Gebäude, Menschen...)
  - **ii.** Welche Elemente dieser Beschreibung sind für Sie negativ? Unangenehm? Stressig?
- **c.** Was könnten positive/negative ODER angenehme/unangenehme Elemente sein, in einer Zeit in der es Ihnen nicht so gut geht?

B. Können Sie mir sagen, nach welchen Kriterien Sie unseren Rückweg ausgesucht haben?

- **a.** Welche Orte meiden Sie? Warum?
  - **b.** Wohin gehen Sie besonders gerne? Warum?

C. Können Sie beschreiben, wie Sie diesen Weg in Bezug auf die Sinneswahrnehmungen (Sehen/Hören/Berühren/Geruch) erlebt haben?

- **a.** Haben Sie Situationen erlebt in denen solche Sinneswahrnehmungen sehr wichtig/sehr intensiv waren?
  - **i.** angenehm/ unangenehm?
  - **ii.** Was haben Sie in diesem Fall gemacht?
  - **iii.** Wie kann Licht/Klang/Duft beruhigend sein? Beispiel.
  - **iv.** Wie kann Licht/Klang/Geruch stressig sein? Beispiel.
- **b.** Haben Sie manchmal das Gefühl, dass Sie bestimmte Details eines Ortes (Licht, Geräusche, Gerüche) überwältigen? Ist es eher ein einzelner Sinn oder eine Kombination von mehreren Sinnesreizen?

D. Können Sie mir die physischen Elemente der Stadt (Gebäude, Straßen, etc.) beschreiben, die Ihnen Probleme bereiten, die Ihnen nicht gefallen?

- **a.** Gibt es Situationen (Gebäude, Einkaufszentren, Kreuzungen), an denen Sie sich desorientiert fühlen? Warum?
- **b.** Gibt es Situationen, die Ihnen zu kompliziert erscheinen, um sie zu verstehen (um sich zurechtzufinden, mit dem Bus zu fahren, etc.)? Warum?
- **c.** Gibt es Orte, die Sie wegen Gebäuden und meiden? welche? Warum?
- **d.** Finden Sie leicht Ihren Weg, wenn Sie an einen Ort gehen, an dem Sie noch nie zuvor waren?
- **e.** Ist es wichtig, dass Sie weit sehen können, oder im Gegenteil, dass Sie nicht weit sehen können?

E. Können Sie mir sagen, wie Sie die Abfolge der verschiedenen Kontexte/Atmosphären erlebt haben?

- **a.** Sind Ihnen die Übergangsmomente (Abbiegen an einer Straßenecke, Betreten und Verlassen eines Gebäudes, Betreten und Verlassen eines Parks, Betreten und Verlassen einer Hauptstraße) besonders wichtig? Warum?

F. Soziale Interaktionen

- **a.** Gibt es Orte die Sie meiden, wegen der Menschen die sich dort befinden? Warum?
- **b.** Gibt es soziale Interaktionen/Situationen, die Ihnen unangenehm sind? Wo finden die zum Beispiel statt?
- **c.** Fühlen Sie sich wohl in einer Menschenmenge? Mit welcher Gruppe von Menschen fühlen Sie sich am besten/schlechtesten?

G. Ausklang/Öffnung:

- **a.** Können Sie mir kurz beschreiben wo sie aufgewachsen sind, und wo si bis jetzt gelebt und gearbeitet haben (Stadt vs. Land)?
- **b.** Würden Sie sich eher als ‚Stadtmensch' oder ‚Landmensch' bezeichnen?
- **c.** Haben sich die Orte, an denen Sie Oft gehen seit Beginn Ihrer gesundheitlichen Probleme verändert?
- **d.** Hat sich die Art und Weise, wie sich diese Orte für Sie anfühlen, seit Beginn Ihrer gesundheitlichen Probleme verändert?
- **e.** Wie würden Sie einen "idealen Ort" beschreiben (physische, aber auch soziale Merkmale)? Glauben Sie, dass Sie einen solchen Ort in der Stadt Basel finden können?

7.4. Appendix D

EKNZ

Ethikkommission
Nordwest- und
Zentralschweiz

Prasident
Prof. Christoph Beglinger
Vizeprasidenten
Dr. Angela Frotzler
Dr. Marco Schaerer

Marc Winz
Université de Neuchâtel
Institut de Géographie (IGG)
Espace Louis Agassis 1
2000 Neuchâtel

Basel, 15. Juli 2019 / cb

Verfügung der Ethikkommission Nordwest- und Zentralschweiz (EKNZ)

Project-10	2019-00953
Projekttitel	Perception and experience of urban spaces by persons having experienced a first episode psychosis and persons with an increased risk for psychosis
Master-/Doktorarbeit von	Winz, Marc
Haupt-Prüfer / Koordinierender Prüfer	Marc/ Winz
Sponsor	Marc/ Winz
Zentren	Marc / Winz, Université de Neuchâtel, Neuchâtel

Entscheid

x Die Bewilligung wird erteilt. Die Auflagen vom 11.6.2019 sind erfüllt.

Anmerkungen / Auflagen / Bedingungen / Begründung

Keine.

Klassifizierung

IZI Forschungsprojekt gemass HFY — Kategorie: A

- IZI Forschung mit Personen
- 0 Weiterverwendung des biologischen Materials oder der gesundheitsbezogenen Personendaten
- ☐ mit Verstorbenen
- ☐ mit Embryonen / Foten
- ☐ mit ionisierender Strahlung

Entscheidverfahren

☐ ordentliches Verfahren ☐ vereinfachtes Verfahren x Prasidialverfahren

Die Ethikkommission bestatigt, dass sie nach ICH-GCP arbeitet.

Geschaftsführerin Irene Oberli | Hebelstrasse 53 | 4056 Basel | Tel 061 268 13 50 | Fax 061 268 13 51 | eknz@bs.ch | www.eknz.ch

Seite 1 von 4

Rechtsmittelbelehrung

Gegen diesen Entscheid kann an den Regierungsrat des Kantons Basel-Stadt (Rathaus, Marktplatz 9, 4051 Basel) rekurriert werden. Der Rekurs ist innert 10 Tagen seit Eroffnung des Entscheides bei der Rekursinstanz anzumelden; innert 30 Tagen, vom gleichen Zeitpunkt an gerechnet, ist die Rekursbegründung einzureichen, welche die Antrage und deren Begründung mit Angabe der Beweismittel zu enthalten hat. Bei volliger oder teilweiser Abweisung des Rekurses konnen die Kosten der Rekurrentin respektive dem Rekurrenten ganz oder teilweise auferlegt werden.

Kopie an

☐ BAG

cgj Andere — Christina Andresou, Christina.Andreou@upk.ch
Ola Sôderstrom, ola.soderstrom@unine.ch

Unterschrift

Prof. Dr. med. Christoph Beglinger
Prasident

Anhang:
1. Pflichten des Sponsors/der Prüfperson oder der Projektleitung
2. Mogliche Entscheide und ihre Bedeutung
3. Eingereichte Dokumente (3.7.2019, 9.7.2019 und 12.7.2019)