




How environments get to the skin: biosensory ethnography as a method for investigating the relation between psychosis and the city

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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 ‘revitalized’ 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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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 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 schizophrenia¹ 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 centres (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 (Mortensen and Pedersen 2001). 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 (Mortensen and Pedersen 2001). 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, pp. 238–239).

Recently, some social scientists (Callard and Fitzgerald 2016; Des 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 and Rose

¹ 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’.



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 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” (Des 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 and 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.

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 and Mortensen 2001; Sundquist et al. 2004) or neighbourhood scales (e.g.: Kirkbride et al. 2007; Van Os et al. 2000). However, as Philo (1986, pp. 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 and Van Os 2005; van Os et al. 2008, 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. 2016; Rutten and Mill 2009; Toyokawa et al. 2012), notably with regard to schizophrenia (Maric and 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 and 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 et al. 2008; Walker and 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 (Des 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 et al. 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 and 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 and 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 (Manning et al. 2018). 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 and ethnographic data.² This is what we discuss in the following section.

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

² 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.



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 and 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 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 “plastic modifications of the body mediated by environmental stimuli, social conditions and life experiences” (Chiapperino and Panese 2019)—which is also present in a vitalist account of the encounter between bodies and milieus (Greenhough 2016).

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 and 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 psychophysiological 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 and 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.

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 and 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 and 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 and 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 and 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 and 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 and 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 2013).

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 et al. 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.

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 and 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 and 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 and 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.

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” (Des 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.

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Compliance with ethical standards

Conflict of interest Intellectual or financial: in the research detailed in the manuscript: none.

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