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ENVIRONMENT AND MENTAL HEALTH

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SUMMARY

Environments seen as the physical, chemical, and biological conditions to which organisms are subjected, define the ways we obtain various resources, their quantity and their quality. In interplay with our organisms, environments determine how 'fit' we are. An aspect of that fitness is the quality of mental functioning.

Although there is a traditional view that there is something like an 'objective environment' and an 'effective environment', a part of the objective environment that actually affects the organism, the dividing line between the two is rather obscure. Environment in general cannot be defined without taking into account the behaviour of the organism, and it is especially challenging to define what environment means to humans, given the enormous variation and scope of human behaviours; what it is that we require and tolerate. Simultaneously, that physical environment is the broader context of what we usually term 'social environment'.

This paper outlines the conceptual problems in determining and evaluating the relationship between environmental conditions and more proximal determinants of mental health, at the same time reviewing the assumptions of some of the well-known examples of that relationship.

Key words: *environment - climate - nutrients - mental health*

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„Remember that no matter how selfish, how cruel,
how unfeeling you have been today,
every time you take a breath,
you make a flower happy. " *Mort Sahl*

INTRODUCTION

Regardless of the fact that the concept of 'environment' has such an important role in any attempt to understand the determinants of various forms of behaviour, including its pathological variants, vast majority of elementary textbooks of psychology and psychiatry seem to neglect the need to offer a strict definition of the term. The term invokes different associations when mentioned to psychiatrists, psychologists, pedagogues, geneticists, or ecologists. Every biologist will probably agree with the definition that says it is „the complex of physical and biotic factors within which an organism exists" (King & Stansfield 2006) or even more simply that it is „the physical, chemical, and biological conditions of the region in which an organism lives" (A Dictionary of Biology 2004). A geneticist might also be in favour of a more strict definition of environment as anything that isn't a gene and affects the determination of phenotype, while some would even go so far to include other genes as environment from the standpoint of a single gene (Gross 2009).

However, with the physiological tradition started with Claude Bernard and his concept of *milieu intérieur*, being what is „under the skin" (commonly known as internal environment), it is fully acceptable to treat the organism as a whole as that which is surrounded by external environment. Such a conception opens way for much more easily operationalised and intuitively accepted definition of environment. This conception predominates in psychology and psychiatry. It was the developmental psychobiologist Daniel Lehrman who offered clear arguments insisting that it is the organism that interacts with the environment, not the genes (Bateson & Gluckman 2011). The homeostasis, a concept that originated from Bernard's *milieu intérieur*, is indeed maintained not only by relatively automatic physiological mechanisms, but also by what is known as regulatory behaviour (Morgan & Stellar 1950, Kolb & Whishaw 2009).

In rather simple terms, external environment can be defined as „the sum total of all those stimuli outside the body that could impinge on an organism" (McGuigan 1994). However, a fact that often goes overlooked, is that behaviour influences not only the functioning of the organism in response to the environment, but the very exposure of the organism to the environment as well, the exposure to these stimuli; in a way, the definition of environment itself. It is, in fact, impossible to define environment without understanding the behaviour of an organism (Lewontin 2002). A distinction is also offered, that points to the importance of how such stimuli are selected. Those energetic processes and their carriers that in a certain period of time actively affect the organism and elicit sensory processes can be termed „effective environment", as distinct, and selected from, „objective environment" (Pečjak 1981). Given the fact that various species have different constitution of their senses, various species of animals in a way have different (effective) environments. In addition to this, when we discuss the richness of environmental influences on

the determination of the psychological makeup of human beings, it is quite natural to say that the vast variation of human behaviour strongly affects how that selection is made. An illiterate person can live in close proximity to a huge library, yet, it could hardly count as his or her environment.

In a similar sense, ecologists make a distinction between habitat and a more abstract concept of 'ecological niche', which points more on how, rather than where, an organism lives (Begon et al. 2006).

Still, much attention is often devoted, especially in the popular literature or the general media, to those parts and aspects of objective environment for which it is difficult to know whether they exert real effect on the human organism, let alone on mental health. There are too many ideas about such relationships, or even classes of environmental influences to count. Those we chose to describe and comment on, although a relatively arbitrary selection, invariably revolve around the concept of the active role of human beings in shaping their own environment.

CELESTIAL INFLUENCES

While astrological theories are almost completely disregarded in serious mental health studies, many mental health professionals seem to believe the moon phases exert certain influence on human behaviour. This belief has no physical foundation, since, for instance, the visibility of the moon does not correlate with its distance from Earth which negates the hypothesis about the gravitational impact of the moon on the mass of water contained in the human body, which is sometimes used as an explanation of this „Lunar effect“, also called „Transylvania effect“. Also, it has been estimated that a mosquito sitting on a person's arm exerts a more powerful gravitational force on that person's body, than does the moon (Lilienfield et al. 2010). The origin of this belief is probably related to the times when moon had much greater impact as a source of light (Parry 1999), something that is not the case in industrialised societies any more. And although a large analysis of previous studies was published in 1985, claiming that no further such studies are needed (Rotton & Kelly 1985), research still goes on, with many discussing methodological intricacies (e.g. Russell & de Graaf 1985), only to again mainly confirm that there is only weak association, or complete lack thereof (McLay et al. 2006, Bierman et al. 2005, Wilson & Tobacyk 1990, Rusell & Dua 1983), with only occasional and special exceptions (Röösli et al. 2006). There is simply no reliable evidence that the moon can influence our biology (Foster & Roenneberg 2008, Barber 2010), even in such sensitive cases where it might be expected, if ever – in patients that underwent surgical procedures (Kredel et al. 2006). Oddly, the belief in the association between the moon and behaviour, especially of mental health service users, persists – in many mental health professionals (Owen et al. 1998).

SURROUNDINGS – FROM INVISIBLE TO LIFE-THREATENING

People do not see electromagnetic waves, and yet thanks to science we know of their existence. There is considerable concern about their effects on health. In the domain of mental functioning, a Swiss study showed that increased levels of radiation within the radius of 900 metres away from a local shortwave transmitter station lead to unwanted effects that include sleep disturbance, anxiety and tiredness (Alpeter et al. 1995). These effects were shown regardless of whether the inhabitants were aware of the operation of the transmitter. However, with many other types and intensities of electromagnetic fields, it seems that it is the belief that the fields are harmful that leads to adverse effects and stress, manifest e.g. in avoidance behaviour such as trying to spend more time away from the sources of electromagnetic fields (Beale 1997).

In studies focusing on the effects of humidity, occasionally one may hear the mention of air-ions as putative mediators of effects of humidity (Salib & Sharp 2002), although it is actually not clear whether they exert any influence on human beings (Wiszniewski & Suchanowski 2008).

Heat waves are defined in relation to the normal climate for the geographical area, and pose considerable risk for many a mental health service users. The kind of risk increase that appears during heat waves is such that it calls for significant involvement by mental health professionals to prepare their clients to adapt to the heat and to pay additional care for their health in those circumstances, but also the need for the professionals to monitor their clients more closely themselves (Cusack et al. 2011). Heat waves increase morbidity and mortality in mental health service users, in some instances dramatically, and that with a threshold of only 26.7°C, above which admissions increase markedly; especially for organic mental disorders, dementia, affective disorders, neurotic, stress-related and somatoform disorders, and disorders of psychological development (Hansen et al. 2008).

Globaly, climate change involves three projected physical consequences, namely temperature rise, sea level rise, and extremes in the hydrologic cycle (Patz et al. 2000) and their manifestations might be on the increase, posing ever more risk for health. The idea of the link between weather and health dates back to antiquity. Relationships have been found in the domain of physical health, such as headaches (Yang et al. 2011), including the role of the notorious Foehn (Strauss 2007), or the onset of cerebrovascular insults (Zec et al. 1965). Many studies have demonstrated the relationship between e.g. seasons of the year and suicide rates (Kposowa & D'Auria 2010), but the entire field of studies exploring the impact of weather and various mental disorders is characterised by significant variation in the methodological approaches. This, in addition to the fact that the mechanisms of such potential effects

are elusive and perhaps variable from one medical condition to another, obscures the way to more definitive conclusions (Deisenhammer 2003). The impacts of slowly developing changes such as those in droughts are quite distinct than those of fast changes, and produce cumulative stress leading ultimately to mental health problems (Dean & Stain 2010). As in the case of electromagnetic fields, there is an often overlooked mechanism that mediates the effect of climate changes on mental health. It seems that a very powerful effect produced by climate change is actually indirect – acting through the social, demographic, and economic disruptions (McMichael 2006). The social environment thus imposes itself as a factor that cannot be disregarded in attempts to understand the overall relationship between weather and mental health. Some instances of the role of such socially produced surroundings are particularly significant. People living in a medium size city are about one and a half times more likely to develop schizophrenia than are people living in the country, and the risk is even higher in larger cities, and in case urban living started early (Watson & Breedlove 2012). These urban-to-rural differences have been found in Sweden, Denmark, and the Netherlands (Peen & Dekker 2004). Still, it is not known whether the active component of such „urbanicity" risk lies in stress, pollution, social structure, familial aggregation, or something else. In line with the folk-belief, being surrounded with green space improves physical and mental health and longevity, probably through restoration of stress and attentional fatigue (Groenewegen et al. 2006), and perhaps surprisingly, apparently not through encouraging physical activity (Maas et al. 2008).

NUTRIENTS AND DRUGS

Our environments in the broadest sense of the word provide the context in which we obtain nutrients. Increasing attention is being paid to the fact that environmental pollution may lead to very clear biological effects through foods. Pollutants can even be biotransformed into potent hormones, such as androstenedione and progesterone (Nelson 2005). Regarding the users of psychopharmaceutical agents, psychiatrists have for years now been aware of the so-called „cheese-effect" in which tyramine-rich foods such as cheese, wine and pickles increase the risk of strokes in people who take MAO inhibitors (Pinel 2009). This is an example in which foods present a part of (potential) environment, but the behaviour of feeding has the capacity to regulate the outcome in the broader context. If we reflect on the previous discussion on what environment is, it is also worth noting that, on the molecular level, nutrients are factors in modulating gene expression and protein activities (Jacka & Berk 2007).

The number of studies examining the relationship of nutrients and various psychological and behavioural measures is constantly increasing, some deriving hypotheses from popular, „folk" beliefs. The fundamental link lies in the fact that nutrients affect the brain in the structural and chemical manner, and through affecting the vasculature, these effects ranging from short- to longer-term ones (Bryan 2004). However, although similar in design, compared to studies in psychopharmacology, these studies naturally suffer from certain methodological flaws (Lieberman 2007), including those arising from the need to study diet as a whole as opposed to its isolated components (Jacka et al. 2009). The role of environmental factors in the development of autism spectrum disorders is still far from being fully elucidated (Berg 2009). On the other hand, the belief persistently propagated by popular media, that sugar ingestion affects the behaviour of children, appears to be a complete myth, and it is probably the attention that parents pay to their children's diet that produces real effects (Young 2002). It has also recently become evident that environmental and/or nutritional factors might play a role in the development of Alzheimer's disease (Shcherbatykh & Carpenter 2007). Much hope has been given to omega-3 fatty acids with regard to treating mood and behaviour, including e.g. borderline personality disorder (Peet & Stokes 2005), since it was shown that they, together with essential vitamins and minerals are exceptionally deficient in people suffering from mental disorders (Lakhan & Vieira 2007), although it appears there are no substantial proofs that potential for such treatment really exists (Soh et al. 2009). Particularly interesting are the studies suggesting that nutritional factors may be of significance in the onset, but also treatment of depression (Harbottle & Schonfelder 2008), although the results seem to suggest, not surprisingly, that some rules apply only to some groups of patients (Soh & Walter 2011). The concern that mercury contained in amalgam dental fillings can enter the metabolism has instigated a number of studies, some showing that the faecal mercury excretion can amount up to hundred times the mean intake of total mercury in normal diet of the given population (Skare & Engqvist 1994), although overall mercury most probably cannot be associated with deficits in cognitive or fine motor functioning, at least in healthy adults (Factor-Litvak et al. 2003). Overall, it seems that the size of effects that nutrients make on behaviour is small, however, not substantially different in comparison to effects of many medicinal or investigational drugs (Riedel et al. 2003).

CONCLUDING REMARKS

Environmental influences on the functioning of the human organism range from very distal to most proximal. Scientists today agree that even hormones, very proximal factors, belonging to the internal environment itself, affect behaviour only in context of the current situation of the organism (Breedlove et al. 2007, Pfaff et al. 2004), or as seasoned psychiatrists will probably confirm, the patient actually needs to „know how to take the drug". These effects, of course, can appear in cascades, as in the example of pollutants acting as hormones and affecting food, or many other ways (Silver & Kriegsfeld 2002). And yet, there are still

tendencies to ascribe unequivocal relationships and effects to far more distal environmental factors and circumstances. Some of these influences can indeed be most damaging to mental health of a person. If a tornado blows away your house, you are very likely to feel bad about it. But in some other instances, chances are you have a certain amount of choice and possibilities to mitigate the adverse effects of many environmental influences. Some environmental influences pose as no more than a neat distraction from the daily hassles, or even an excuse for not feeling well. It might be the case that if the weather is bad, at least some people can feel bad. But in addition to that, people also *feel entitled* to not feeling well in such circumstances.

The astonishing variation of living conditions in areas inhabited by humans across the globe testifies to the fact of adaptability of our species. To a large extent, it is the socioeconomic status that has become perhaps the major determinant of what options people have at hand to satisfy their various needs. One can now relatively easily eat a pineapple even if he or she doesn't live in tropical areas, at any time of year. Still, some environments sometimes dictate gross scarcity of various resources, in both qualitative and quantitative terms. Yet humans thrive in such areas, from generation to generation. The key to such ability lies in the enormous variation of behavioural choices, of possible actions that one might undertake. Over longer terms and on the level of populations, behaviours such as migration in response to adverse living conditions can have far-reaching consequences.

On the individual level, mental health in face of adverse environmental influences of various kinds is related to the repertoire of possible behavioural responses, to a person's system of values, beliefs, abilities. And especially in the case of mental health service users, it is the duty of mental health professionals to help expand that repertoire by teaching. And it is a must for users to learn and thus build a more active role in protection of their mental health. If myths about nonexistent influences are broken, and proper warnings and advice given when there are existing risks, such as in the case of heat waves, a valuable contribution to mental health is made. Responsibility is also transferred to users themselves, empowering them to utilise the expanded set of choices, and to get involved in the dissemination of newly acquired knowledge. Because, while some of the main challenges that mental health service users face, remain their own to tackle, with only so much help as they can get from others, it is often in groups that we respond to so many of life's adverse situations. And it is in that social context that we also learn to be as effective as possible in dealing with adversities.

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