

CURRENT SCIENCE

Volume 118 Number 4

25 February 2020

GUEST EDITORIAL

Is ambient space a determinant of human health?

Emptiness which is conceptually liable to be mistaken for sheer nothingness is in fact the reservoir of infinite possibilities.

– Daisetz Teitaro Suzuki

World Health Organization defines health as ‘a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity’. Mental and physical well-being are linked to ‘spiritual health’, ‘emotional health’ and ‘financial health’ because of shared association with lower stress levels. The predominant determinants of health are genetics, social, economic and physical environment, nutrition, lifestyle and access to health services. Several determinants of health in the physical environment are known and these include pollutants in the air, water, soil, and food, natural and technological disasters, climate change and occupational hazards. Another factor which influences living organisms is the external milieu which could be the surrounding atmosphere, water or vacuum. Studies on function and dysfunction of humans have centred mostly on the physical body and to a lesser extent on the environment. We propose that the three-dimensional space around individuals could also be a target for intervention to maintain health.

The term ‘space’ is generally used in the context of outer space. The English word ‘space’ is derived from the Latin word for expanse – *spatium* (room, area, distance, stretch of time) and from the French word *espace* (period of time, distance and interval).

Interestingly, the existence, form and attributes of space have been deliberated from ancient times. We can find them mentioned in treatises such as Plato’s *Timaeus*, the *Physics* of Aristotle, in Socrates’ reflections on what the Greeks called *khora* (i.e. space) and in the *Discourse on Place (Qawl fi al-Makan)* of Alhazen, the 11th century Arab polymath. Ancient Eastern philosophers thought that life originated from space and remarked that awareness preceded the manifestation of space. According to them, we have space in the Universe on lease and when we perish, the physical body goes to the earth space and emotional body enters the vastness of space. These then are the building blocks for another life to blossom.

Rene Descartes defined space (Cartesian space) as Euclidean in structure – infinite, uniform and flat – and

containing matter. Matter by definition had a spatial extension; thus, space is not void. Gottfried Leibniz, a German philosopher–mathematician perceived space as a collection of relations between objects. For Isaac Newton, space was absolute with an invariable and independent existence, irrespective of whether there was any matter within. The German philosopher Immanuel Kant opined that the concepts of space and time are part of a scheme that humans own and use to organize all experiences. He indicated that the experience of ‘space’ is ‘pure a priori form of intuition’, and hence subjective.

The concept of space has been central to understanding the physical universe. Space is one of the fundamental quantities in physics, similar to other fundamental quantities such as time and mass. Modern physicists consider physical space with time to be part of a limitless four-dimensional continuum known as space–time. It appears that space was created 13.8 billion years ago, in the Big Bang. Space is known to be expanding rapidly because of cosmic inflation.

There are different classes of spaces. Modern mathematicians define space as sets, commonly described as different types of manifolds. Geographical space is land which has an impact on human and cultural behaviour. It is an important factor in architecture, the design of buildings and structures. The term ‘public space’ denotes land collectively owned by a community, while private space is the land owned by an individual for his/her own use and pleasure. In the social sciences, space has been studied from several perspectives such as Marxism, feminism, postmodernism, postcolonialism, urban theory and critical geography. In his book *The Production of Space*, Henri Lefebvre discusses the several overlapping social processes that produce space. In *Third Space*, Edward Soja addresses the binary way in which humans understand space – either physical or as imagined. Lefebvre argues that spatiality is an integral and neglected aspect of how we inhabit, experience and understand the world.

All of us are specific about the spaces we inhabit. We build our habitats for not only living, but to provide us emotional satisfaction as well. We recognize private space, personal space, professional space, social space and spiritual space. Awareness of the living space of a person is critical to safeguard long-term survival, similar to the ecological niches that are relevant to the survival of

different species of life. Awareness of the surroundings was important for survival of our ancestors, in relation to hunting, self-preservation as well as conceiving personal space. How we conceive our physical space depends on our needs. If work is to be done, a 'productive space' is necessary. For working as teams and groups, we require 'communal spaces' – conference rooms or niches, which also need to have the tools and facilities to aid productivity. Creativity necessitates a different space. Occasionally, a 'resting space' may be desired.

Space, often considered as void, does have a quality other than emptiness. Everyone has spatial experiences that express something, however, not always consciously grasped. We speak of 'confined feeling' in a small cave and 'inspiring' experience in a temple or church. Spatial experiences are based both on visual cues and the potential for movement. Available light and surrounding colour, texture and decorations are known to influence the experience of space. Spatial experiences both of interiors of buildings and outdoor locations such as gardens, hills, river shores and beaches can be awakened by works of art as well. Humans can distinguish harmony from discord in any spatial relationship.

The seat of emotions, goals and belief systems is considered to be the mental space which has both a cognitive, conscious manual pilot mode and a non-conscious, automatic, emotional, inaccessible intuitive space that functions in the automatic pilot mode. According to the theory of mind, humans have the ability to look at the mental space of another person, have reciprocal resonance in the mind space, interpret and react or decide not to react. The mental space is in continuum with the universal space. Note the difference in one's feeling when aside a flowing river and when in a noisy environment.

Psychologists of the middle of 19th century initially started the study of how we perceive space. They were concerned with how we recognize an object's physical appearance or its interactions. Discerning three-dimensional space (cognizing visual space) is considered to be learnt during infancy, using non-conscious inference, and is intimately linked to development of hand–eye coordination.

The neuroscience of spatial cognition integrates theories of neural coding, learning, memory and cognition. Neural codes incorporate spatial information about stimuli and also responses suited to mediate spatial behaviour in the immediate environment. Recent studies provide newer understanding of the mechanisms of spatial cognition in mammals, including humans. The hippocampal region in the mammalian brain has detailed representation for spatial awareness. Patients with damaged hippocampi and general episodic amnesia have deficits in spatial orientation and navigation as well. Atrophy in the hippocampal formation is often an early feature in the progression of Alzheimer's disease. Several space-related phobias are

also known and include claustrophobia (fear of enclosed spaces), agoraphobia (fear of open spaces) and astrophobia (fear of celestial space).

There are evidences to suggest that living organisms may communicate through the medium of space. Apart from language and gesture, communication seems possible by other means such as fragrance, infrasound signals, pheromones, etc. In animal experiments, the mother's heart rate and blood pressure were found to be abnormal when the offspring were killed under water. Genetically equipped dogs are known to sense epileptic seizures and warn patients early; however, the mechanism is unknown. Animals are also known to recognize early signals of natural disasters. These and para psychological phenomena such as telepathy and clairvoyance could have mechanisms that operate through space, which provides a medium for faster connectivity through vibrations, waves and analogue signals. Other than nerves and hormones, extracellular space could be a medium for connectivity inside animals.

We propose that characteristics of mental and ambient spaces are also determinants of the quality of human health. Studies in this domain must comprise: (i) physico-chemical characteristics and molecular interactions within different spatial compartments; (ii) determination of the origin of different forms of energy in various spaces and effects of different types of energy on features in different compartments of space; (iii) relationship of ambient spatial dimensions, forms and energies with homeostasis and complex functions in organisms, and (iv) spatial features that cause disease states.

What is the scope for spatial interventions as a strategy to reverse or modify abnormal cognitive and behavioural functions in humans? Spatial intervention strategies could aim to harmonize resonating frequencies in the body and ambient space, and improve emotional quotient and mental space function. Spatial interventions may aid development and strengthening of the intuitive mind as well as improve emotional resilience and thus possibly reduce professional failures. Recreating past nostalgic space could be effective for rehabilitation of cognitive impairment. Nurturing the intuitive mind space could foster talent in children who are known to have a virgin intuitive space.

A. Anandkumar¹
C. C. Kartha^{2,*}

¹Department of Neurology,
Amrita Vishwa Vidyapeetham University,
Cochin 682 041, India

²Kerala Institute of Medical Sciences,
Thiruvananthapuram 695 029, India

*e-mail: drkartha.cc@kimsglobal.com