Turkish Online Journal of Qualitative Inquiry (TOJQI)
Volume 13, Issue 1, January 2022: 263-288

Design Considerations to Improve The Health & Well-Being of School Children

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Abstract

Health is a prerequisite for all human pursuits. The environments in which we live, work, learn and play have a direct impact on our health. Yet, it is uncommon to ask architects and urban designers to include health promotion among their design criteria when they shape our built environments. This is especially true of the learning environment of schools in which our children spend most of their waking day. With the onset of a pandemic into a world already burdened with persistently rising lifestyle-related diseases, it is even more crucial to support our overstressed healthcare systems. Not only adults but even school children are prone to lifestyle diseases like obesity, hypertension, and depression, leading to the poor overall health of society. Even though life expectancy has increased in the past few decades, the quality of life and health are constantly deteriorating. Holistic health, or salutogenesis, is an approach that seeks a complete mind-body-spirit balance to maintain overall health and prevent diseases. Salutogenic design focuses on positive environmental interventions to promote salutogenesis and bridges the gap between architectural design, neuroscience, and psychology.
The aim of this paper is to identify the health promoting components of the built school environment through the lens of salutogenic design. It demonstrates how children's experiences in salutogenic school environments could affect their ability to create positive emotions and experiences that may lead to a heightened sense of coherence and improved holistic health.

Keywords: holistic health, built school environment, salutogenesis, salutogenic design, sense of coherence, salutogenic design guidelines.

Impact and Implications

Today, 1.7 billion children are educated worldwide in trillions of dollars worth of obsolete school facilities that militate rather than facilitate holistic health and well-being. Tens of billions of dollars of annual funding continue to be invested in existing and new buildings that simply perpetuate the problem. The positive implications for students to learn in safe, healthy and mentally uplifting places whose design is driven by extensive research about holistic human health and well-being are profound and incalculable.

1.0 Introduction

The true measure of any nation's standing is how well it attends to its children—their health and safety, their material security, their education and socialization and their sense of being loved, valued, and included in the families and societies into which they were born.

—UNICEF, 2007

The World Health Organization has illustrated in its 'Ottawa Charter for Health Promotion,' a holistic approach to health, stating, 'to reach a state of complete physical, mental and social well-being, an individual or group must be able to identify and to realise aspirations, to satisfy needs, and to change or cope with the environment' (WHO, 1986). Additionally, emphasising the link between health and education, the Incheon Declaration states that quality education 'develops the skills, values, and attitudes that enable citizens to lead healthy and fulfilled lives, make informed decisions, and respond to local and global challenges' (UNESCO, 2016).We cannot realise the above mentioned health and education goals without an appropriate environmental setup. Even in the 4th century B.C., Hippocrates knew that the physical environment in which people live affects human health. With lifestyle-related diseases rising (NCMH, 2005) among adults and children, the environment in which we spend most of our time needs to be studied as a prerequisite to realising health promoting architecture. A healthy built environment is multidimensional—It is more than just adequate light and ventilation. Research has now proved that physical spaces have the potential to induce certain moods in their habitants (Day, 2014). Moods induced by places have psychosomatic tendencies toward health and sickness, hormonal balance, and the vigour with which our bodies fight pathogens. Psychoneuroimmunology explains how places and ambience nurture people. According to Day, sensory aesthetics also have a significant impact on health and well-being (2007). In a similar vein, Churchill (1943) remarked that 'We shape our buildings; thereafter, they shape us'. Children, like wet clay, are more quickly shaped by the environment where they spend most of their childhood years. School is next only to home and neighbourhood when it comes to the places where children spend most of their waking hours. The current figures for rising suicide and depression cases among Indian students show the high levels of stress they are experiencing. The yearly figure of suicide rates by students turned out to be the highest in a decade—over 10,000 in 2018(Kumar, 2020).

It, therefore, becomes pivotal to decipher the attributes of a built school environment that may enhance the health and well-being of children and lead to a healthier society. To create supportive physical environments, it is crucial to understand an individual's fundamental needs (Heerwagen et al., 1995). This study begins by understanding the holistic health perspective and identification of the holistic health needs of children. It then focuses on identifying attributes of a health promoting built school environment based on the theory of salutogenesis (Antonovsky, 1979) and salutogenic design (Dilani, 2008). Further, after reviewing and analysing the literature, this study aims at formulating salutogenic design guidelines for a built school environment, to be used by educational architects for listing appropriate design criteria alongside the varied contextual needs. The scope of this paper is to review and analyse the existing literature to synthesise a new framework of school design criteria.

2.1 Holistic Health: Definitions, Meanings, and Attributes

'It is easier to build strong children than to repair broken men', said Frederick Douglass in 1885. Over 150 years later, 'building strong children' remains as crucial as ever. Claiming a demographic share of approximately 40%, children (0–18 years) form a significant segment of India's population and, therefore, a momentous determinant of its growth and development narratives.

—India Child Well-being Report, 2019

The Oxford Dictionary defines ‘health’ as ‘the state of being free from illness and injury’. This, however, defines what health is not. The English term ‘health’ derives from the Old English ‘hælth’, which is related to ‘whole’ and ‘a thing that is complete’. In 1948, WHO adopted the following definition of health: ‘Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.’ According to the Merriam-Webster dictionary, ‘well-being’ is the state of being happy, healthy, or prosperous. Various terms related to health like wellness, well-being (Aristotle’s eudaimonia and Aristippus’s hedonia; Britannica), and quality of life are used in different contexts but with a common aim.

Two mainstream philosophies define health in their own way, the first being the bio-statistical or the medical approach (Boorse, 1997). According to this approach, there is nothing evaluative or subjective about health and diseases. Health is the absence of disease, and disease is a type of internal state, which is an impairment of normal functional ability or a limitation on functional ability caused by environmental agents (Nordenfelt, 1987). The second mainstream approach is the holistic approach that considers health and disease as two value-laden concepts. The holistic method refers to an overall approach to the health and well-being of the whole person, rather than focusing on illness or specific parts of the body. It considers how an individual interacts with his/her environment and emphasises the connection between mind, body, and spirit to achieve an utmost level of well-being. The holistic approach encourages people to accept responsibility for their health and well-being as opposed to the medical approach that relies on the healthcare system to maintain the health and well-being of people (Sainju, 2018).

Some definitions of health, wellness, and well-being related to the holistic approach are as follows:

—Health is a state of complete physical, mental and social well-being and not the absence of disease or infirmity (WHO, 2021).

—Wellness is an integrated method of functioning, which is oriented toward maximising the potential of which an individual is capable (Dunn, 1961).

—The extent to which an individual or group can realise aspirations and satisfy needs and change or cope with the environment. Health is a resource for everyday life, not the aim of living; it is a positive concept, emphasising social and personal resources, as well as physical capacities (WHO, 1984).

—Health is the capability of individuals, families, groups, and communities to cope in the face of significant adversity or risk (Vingilis & Sarkella, 1997).

—It is a way of life oriented toward optimal health and well-being in which the integration of an individual’s mind, body, and spirit allows them to live life fully within the human and natural community (Witmer & Sweeney, 1998).

—Well-being is a complex construct that concerns optimal experience and functioning (Deci & Ryan, 2001).

—Health is a condition where resources are developed in the relationship between humans and their biological, chemical, physical, and social environment (Lawrence, 2002).

—Well-being is the state of successful performance throughout the life course integrating physical, cognitive, and social-emotional functions that result in productive activities deemed significant by one's cultural community, fulfilling social relationships, and the ability to transcend moderate psychosocial and environmental problems. Well-being also has a subjective dimension in the sense of satisfaction associated with fulfilling one's potential (Bornstein, Davidson, Keyes, & Moore, 2003).

The law of nature states that the whole comprises interdependent parts. This is the basis of holistic health. All the above definitions clearly state the following characteristics of holistic health:

• It is person-oriented rather than disease-oriented.

• Its aim is full, vibrant health (positive wellness), not symptom amelioration.

• It is three-level (physical, emotional, spiritual), not uni-level (physical only).

• It is a long-term, ongoing, and continuous lifestyle.

• It focuses on primary prevention rather than crisis intervention.

• It aims toward achieving full human potential (self-actualisation).

• It focuses on building resilience and building better coping mechanisms.

• An individual's experiences and environment are the basis of holistic health.

The goal of holistic health, therefore, is to achieve a purposeful, vibrant, and healthy lifestyle by emphasising the connection between mind, body, and spirit. A healthy person is a person in balance, normally meaning that different parts and different functions of the human body and mind interlock harmoniously and keep each other in check (Nordenfelt, 1987). The idea of balance is strong in most non-Western medical traditions. Ayurveda, an Indian holistic health system, places great emphasis on maintaining health through a balance of body, mind, and spirit by making appropriate lifestyle changes according to one's constitution (Lad, 2002). Ayurveda considers the surrounding environment and society as part of the broad concept of health. Many other ancient schools of thought have insisted upon the relevance of holistic health. The concept of health as a balance between a person and their environment, along with the unity of 'soul' and 'body', was the basis of the perception of health in ancient Greece (Svalastog et al., 2017). Holistic health may therefore be defined as the ability to maintain a state of equilibrium and balance between genetic factors and environmental conditions, mental-spiritual and bodily functions along with the interaction between individual and community, together leading to the attainment of full human potential (self-actualisation) and the building of a sound coping mechanism (resilience)

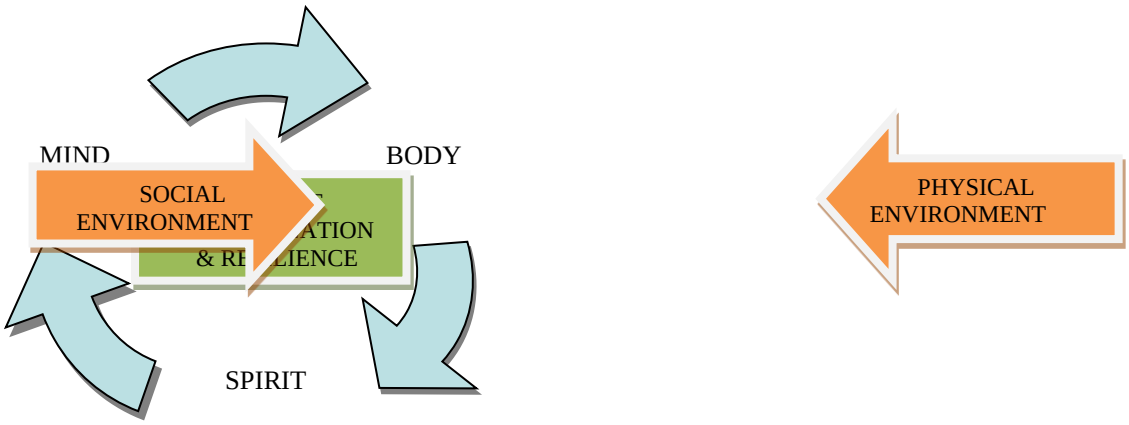


Figure 1.0: A model of holistic health with self-actualisation and resilience as the ultimate goals to be achieved through mind-body-spirit balance, in the presence and under the influence of physical and social environmental conditions. From Parul Minhas, created in Word, 11-21-21.

Considering the various studies in children's health, child psychology, and environmental psychology (Ex. Maslow (1943), India Child Well-being Report (2019), Deci & Ryan (1985), etc.), 'holistic health needs' associated with overall mind-body-spirit balance are:

- Habitable environment (clean air, water, shelter, thermal comfort, natural light, etc.)
- Safety & security
- Self-esteem/personal growth/self-acceptance
- Autonomy/psychological freedom
- Positive relationships with people and places
- Rich experiences leading to positive emotions
- Competence/capability/accomplishment/mastery
- Engagement/purpose in life

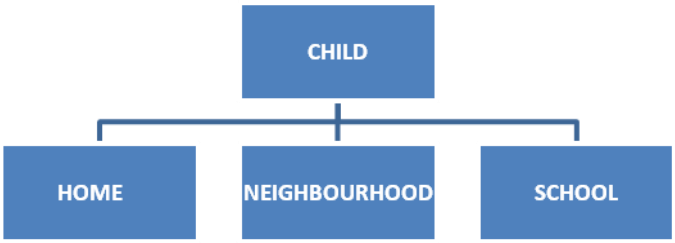
2.2 Child Health and the School Environment

When you pay attention to the beginning of the story, you can change the whole story.

—Raffi Cavoukian

The school environment is one of the primary influences for most school going children, next only to home and neighbourhood environments. Health problems developed at a young age usually affect a child's social, behavioural, cognitive, and physical processes, and get compounded as the child grows. A sedentary lifestyle causes many health problems, such as obesity, which are more easily preventable in childhood. The way a child deals with internal health factors, external environmental factors, and issues of self-identity plays an important role in the development of holistic health (Hembree & Sholder, 2013).

Figure 2.0



Note. Figure 2.0: Primary environments for children. From Parul Minhas,created in Word, 11-21-21

All aspects of holistic health—mind, body, and spirit—gather to form a child's identity. Social interactions shape a child's perception and understanding of incidences in their own life at home and school. Socioeconomic issues affecting lifestyle, opportunities, and primarily the built environment also have a considerable impact on one's holistic health. It is crucial to decipher the characteristics of the school environment (physical) that may assist children in reaching their full potential (self-actualisation) and effectively managing stress (resilience). The theory of salutogenesis addresses both the above factors and is the basis for further research.

2.3 Salutogenesis: The Theory and its Relation to Holistic Health

To ask about health ease, instead of asking about the disease, is to search for weapons that may be far more potent in decreasing human suffering —Antonovsky, 1979

Salutogenesis is a medical approach focused on factors that support human health and well-being rather than on factors that cause diseases (pathogenesis). To be more specific, 'salutogenesis' is a health promoting model concerned with the relationship between health, stress, and coping. Aaron Antonovsky, a professor of medical sociology, coined the term in 1979. The word 'salutogenesis' literally means 'origin of health' and comes from the Latin word salus (health) and the Greek word genesis (origin). According to Antonovsky (1979), health and well-being are related to our ability to cope with the stressors of human existence by seeing the world as making sense, cognitively, instrumentally, and emotionally. Following are some important definitions that can assist in better understanding Aaron Antonovsky's perspectives on holistic health:

1. **Stress:** 'Stress is the condition that results when person-environment transactions lead the individual to perceive a discrepancy—whether real or not—between the demands of a situation (stressor) and the resource of a person's biological, psychological, or social systems' (Turner-Cobb et al., 2008).

2. **Stressor:** 'A demand made by the internal or the external environment of an organism that upsets its homeostasis, restoration of which depends on non-automatic and not readily available energy expanding action' (Antonovsky, 1979). 'The difference between the terms stress and stressors is stressors are agents with potential stress-inducing abilities and stress results from the potential stressor' (Turner-Cobb et at., 2008).

3. **Coping:** 'Coping is an attempt to deal with stress by trying to change the load, and to reduce the symptoms caused by the stressor by increasing resources bound to the environment' (Netterson,

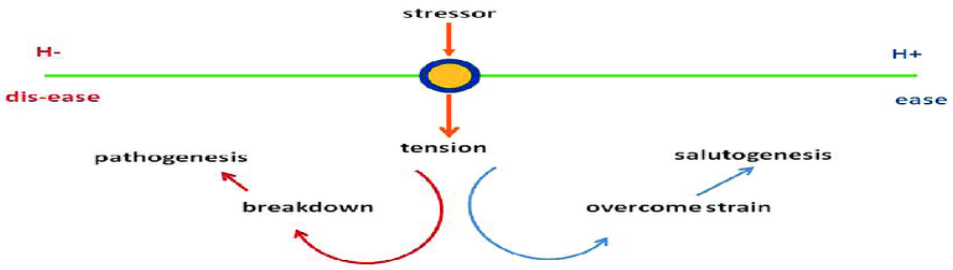
2007). 'The tension level (stress) experienced by people depends upon how they cope with the stressors' (Antonovsky, 1979).

4. **Generalised Resistance Resources (GRRs):** Generalised Resistant Resources (GRRs) are 'any characteristic of the person, the group, or the environment that can facilitate effective tension management' (Ziegler, 2009).

5. **Sense of Coherence (SOC):** 'SOC is the global orientation based on a person's confidence that stimuli are structured and predictable, the resources needed to meet these demands are available, and these demands are challenges, worthy of investment, and engagement' (Antonovsky, 1979). 'It is the capability to perceive that one can manage in any situation independent of whatever else is happening in life' (Mittelmark et al., 2017).

Antonovsky described health as a dynamic process and stated that everyone finds themselves on a continuum between 'maximum health' and 'maximum disease'. He intended to shift the focus away from the risk factors to a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that one's internal and external environments are predictable and there is a high probability that things will turn out as well as can reasonably be expected (Krause, 2011).

Figure 3.0



Note. Figure 3.0: Antonovsky's way of explaining the health continuum and the salutogenic direction. Graphic: D. C. Alvarez et al., Twenty-Five Years Of Capacity Building: The ETC 'Healthy Learning' Process, 2016, European Training Consortium in Public Health and Health Promotion., & Leerstoelgroep Gezondheid en Maatschappij (Wageningen). https://www.researchgate.net/publication/310802076_Twenty-five_Years_of_Capacity_Building

In his theory, Antonovsky (1979) insisted that stressors are indispensable parts of our daily lives and it depends on our SOC whether we allow these stressors to break us down or strengthen us. Antonovsky referred to SOC as a resource that enables people to manage tension, reflect on their external and internal resources, identify and mobilise them, promote effective coping by finding solutions, and resolve the tension in a health promoting manner (Essa, 2020). Research has shown that it is possible to measure a person's SOC and predict an individual's health (Suominen et al., 2001). A strong sense of coherence predicts good health and a low sense of coherence predicts poor health. In his study, Heiman (2004) showed that students with an elevated sense of coherence did not experience increased levels of stress. Antonovsky considered 'generalised resistance resources' as the cornerstones of the development of a strong 'sense of coherence'. These resources are of

different types: genetic and constitutional, psychosocial, cultural, and spiritual material (Lindström & Eriksson, 2005).

Antonovsky defined the core notion of SOC with the following three dimensions:

- **Comprehensibility.**
- **Manageability.**
- **Meaningfulness.**

Comprehensibility: Comprehensibility is a belief that events in one's life can be understood, including challenges (Jensen et al., 2017.). The comprehensibility component contains items to the degree a person experiences internal and external stimuli as cognitive, comprehensible, orderly, cohesive, structured, and clear (Eriksson & Mittelmark, 2017). We may also see it as the ability to find order in chaotic situations. Only if one can comprehend a situation will one be more likely to manage the stress caused by it. We may, therefore, see comprehensibility as the ability to comprehend the situation/change/environment without an unhealthy increase in stress. A person with strong comprehensibility perceives the world as coherent.

Manageability: Manageability is a belief that there is ample availability of resources needed to take action and that things are manageable and under one's control (Jensen et al., 2017). In paraphrasing the words of Antonovsky, manageability is the extent to which one perceives that resources are at one's disposal, which is adequate to meet the demands posed by the stimuli that bombard one, and that they also have the resources under control or feel that resources are controlled by legitimate others like spouses, friends, colleagues, God, etc. A high score on manageability shows that a person is managing adversities without feelings of being a victim or being treated unfairly (Antonovsky, 1987).

Meaningfulness: Meaningfulness is a belief that things in life are interesting, motivating, and a source of satisfaction (Jensen et al., 2017). Meaningfulness is a desire to resolve difficulties and a willingness to invest energy to get through experiences of stress that have the potential to cause distress (Eriksson & Mittelmark, 2017). Meaningfulness is about to what degree life is emotionally understandable and about demands and challenges being appreciated, commitments and efforts handled directly without being bothersome.

Therefore, it can be concluded that people with a strong sense of coherence meet challenges with a desire to be motivated to cope (meaningfulness). They believe that challenge is understandable (comprehensibility), and they believe that resources to meet challenges are available (manageability). The aim is the development of a sense of coherence and to have life experiences that lead to a strong SOC (Similä, 2015).

2.4 Salutogenic Design and the School Environment

Architecture can be psychologically manipulative. Salutogenic architecture is believed to accomplish this manipulation by providing a narrative context that affects a person's behaviour, neural and endocrine systems, and through its influence on the brain and the body.

—Golembiervski, 2017 & Mazuch, 2017

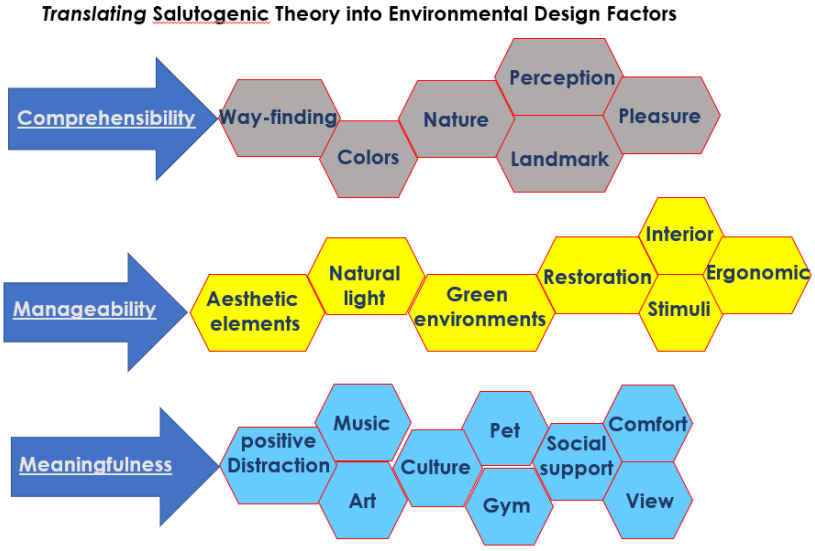
Alan Dilani conceived the idea of salutogenic design, or what he calls 'psychosocially supportive design,' with an intention to promote health. According to Dilani, salutogenic design not only defines the causes of stress but also introduces wellness factors that can strengthen health. 'The theory suggests that we not only design for stress reduction but focus on salutary rather than risk factors' (2001). Dilani raised the question of how the shift from a pathogenic approach to a salutogenic approach manifests in a built environment: 'The basic function of psychosocially supportive design is to start a mental process that […] may eliminate or, at least, reduce anxiety, bringing about positive psychological changes.' Dilani refers to the stress theory model founded by Levi (1972) based on a system that points to a deeper understanding of the physical environment and different human components. According to Dilani (2008), the model describes how the physical environment is the foundation on which we build a societal organisation and, in the long run, promote health or disease.

In 1997, the World Health Organization identified that any health 'arena' should include these frequently used priority spaces: the workplace, schools, hospitals, correctional institutions, commercial offices, public spaces within our towns and cities, and homes. This is the apex of health promotional activity in the 21st century (Dilani, 2001). Adopting a salutogenic approach as a vital part of the building design process creates a preventive care strategy that might shift the focus from the factors that cause illness to the factors that lead to a healthier society.

Salutogenic design, in an educational context, aims to identify the elements of physical school design that can contribute toward the development of a strong sense of coherence, leading to the improved holistic health of children. Dilani created a list of architectural characteristics that he argues can strengthen an individual's sense of coherence. He stated: 'Physical elements in an organisation can contribute to stress, and therefore are essential design factors that can equally increase comfort as well' (2001).

A salutogenic design bridges the gap between architectural design, neuroscience, and psychology. According to Krause (2011), the two primary GRRs that need to be activated to strengthen a child's sense of coherence in school are 'sense of self-worth' and a 'sense of belonging'. Emotions and experiences are central to the building of a strong sense of coherence (Dilani, 2001). The idea here is to create experiences in the built environment that may lead to positive emotions, further leading to a strong sense of coherence. Fredrickson (2001) stateed that positive emotions are much more than a few momentary experiences and can also contribute to holistic health. A sense of self-worth and sense of belonging may be broken down into multiple psychological experiences to connect them with their spatial counterparts in school design.

Figure 4.0



Note. Figure 4.0: Design factors in relation to sense of coherence. Adapted from "Psychosocially Supportive Design: A Salutogenic Approach to the Design of the Physical Environment," by Alan Dilani, 2008, Design and Health Scientific Review, 1(2), pp. 47–55. (https://www.researchgate.net/publication/265349464_Psychosocially_Supportive_Design_A_Salutogenic_Approach_to_the_Design_of_the_Physical_Environment)

The psychological experiences of security, knowledge, and freedom in a built environment can help make that environment more comprehensible. Experiences of self-efficacy and balance can lead to stronger manageability, and comprehending a sense of place and purpose can strengthen meaningfulness in school children.

Table 1

GRRs That Need to Be Activated by/for a High Sense of Coherence at School		
Sense of Self-Worth	**Sense of Belonging**	
Sense of Security & Sense of Knowing	Sense of Self-Efficacy	Sense of Place
Sense of Freedom	Sense of Balance	Sense of Purpose

Table 1: Simplifying the GRRs (Source: Author).

Table 2

Comprehensibility (Sense of Security& Freedom, Sense of Knowing)	**Manageability (Sense of Self-Efficacy & Sense of Balance)**	**Meaningfulness (Sense of Place & Sense of Purpose)**
Safety/Security	Self-Esteem/Personal Growth/Self-Acceptance	Place attachment in school

Autonomy/Psychological Freedom	Competence/Capability/Accomplishment/ Mastery	Engagement/ Purpose in Life
	Habitable Environment (clean air, water, shelter, thermal comfort, natural light, etc.)	Positive relationships with people and places

Table 2: Sense of coherence in the school environment (Source: Author).

Addressing the sense of coherence in school design, we can elaborate on the three attributes of a sense of coherence.

2.5 Comprehensibilty in the School Environment

According to Krause & Lorenz (2009), experiences of consistency are the basis for the development of comprehensibility. In positive cases, children have feelings of security and acceptance in social relations. Consistency in experiences comes when most events in daily lives are predictable. Although it's neither possible nor desirable to predict every experience, as it may lead to monotony, human beings flourish when most of their experiences are consistent so that they can spare more time to pursue what they want to rather than adjust to unpredictable events/experiences. When translated to a built school environment, experiencing consistency would mean being able to comprehend the connection between the various spaces and having confidence that they all connect to form a unified whole, leading to a sense of security and coherence.

A secure environment must, therefore, possess the qualities of being decipherable (Day, 2007) and transparent (Nair & Fielding, 2009). These environments orientate and reassure children by using familiar elements and special features that may assist way-finding and legibility (Dilani, 2001). It requires an optimum organisation of space to control density and assure personal space for everyone. Comprehensible environments are authentic, genuine, and honest, and these qualities may be conveyed through the use of natural materials and construction methods, usually avoiding superfluous decoration and detailing (Hughes, Willis, & Franz, 2019). According to Ken Yeang (2015), 'environmental comprehensibility' requires environmental orderliness, predictability, and legibility. This may refer to the relevance of visual order in the built environment with legibility, intuitive way-finding, and the elimination of visual chaos. The following design guidelines can therefore enhance comprehensibility in a school environment.

2.5.1 Create a Legible and Predictable Layout of the School Environment

Legibility is the degree to which a building facilitates the ability of users to find their way within it (Weisman, 1981). Legibility is crucial to effectively comprehending an environment. Legibility in the school environment can be enhanced by creating unique identities for various locations, by using landmarks as visual cues, by creating well-structured paths, by limiting navigational choices, and by using clear sightlines to show what's ahead (Thapa, 2019). Predictability refers to the degree to which one can predict what can occur or what we expect to occur in an environment. We need predictability to ensure safety and security that can be enhanced through the thoughtful design of spaces with natural surveillance, a welcoming secure entrance, transparency within spaces, use of

familiar elements and sensory connections, and also through safe community involvement (Nair & Fielding, 2009).

2.5.2 Incorporate Details to Encourage Autonomy and Psychological Freedom in the School Environment

Though it is not possible to grant complete freedom to school children, keeping in mind the concerns related to their safety, it is possible to create an environment that makes them feel psychologically free. Architecture can foster autonomy and impact psychological freedom by doing the following:

- Using scale: switches, water taps, door handles, etc. (Walden, 2015)
- Ensuring personal space/controlling density/crowding/territoriality (Walden, 2015)
- Sense of security and feelings of privacy (Sanoff & Walden, 2012)
- Authenticity (Hughes, Willis, & Franz, 2019)

2.6 Manageability in the School Environment

Krause & Lorenz (2009) insisted that experiences of self-efficacy are the basis for the development of manageability. This component grows if the requirements for children are available to their developmental level and if they experience the acceptance of their progress. According to Hughes, Willis, & Franz (2019), a manageable school environment aims to build competence by being well resourced, enhancing the ability to cope, develop further capabilities and undertake required/desired activities. These resources could also be the environments that allow students to exercise control and support activities by being safe, comfortable, and accessible. The inclusive design also forms a part of a manageable environment where students with special needs are considered. Research on inclusive and universal design provides further support (Myerson & Lee, 2010; . It is also crucial for a manageable environment to be flexible and responsive to change and to encourage participatory planning. Dilani (2001) suggested that the environmental components that foster manageability are aesthetics, natural light, green environments, restoration, stimuli, and ergonomics. Comprehensibility is a precondition for effective manageability. The following design guidelines can help develop a sense of self-efficacy and balance in school children.

2.6.1 Increase School Efficiency by Ensuring Comfort and Safety

Comfort here refers to ‘a state or situation in which you are relaxed and do not have any physically unpleasant feelings caused by pain, heat, cold, etc.’ (M.-W. Dictionary). ‘Research suggests that students need to be comfortable (just like adults) to learn’ (Nair & Fielding, 2014). We can achieve comfort through design via thermal comfort, acoustic comfort, visual comfort, physical (bodily) comfort, and olfactory comfort. Also, compliance with the building safety codes is a prerequisite for a healthy school design.

Table 3

Thermal Comfort	Natural ventilation, HVAC, air quality (Barrett et al., 2015).
Acoustic Comfort	Noise control, sound levels complementary to nature (Barrett,

	2015).
Visual Comfort	Colours, natural & pleasant views, natural light, perceived scale, form, etc. (Barrett et al., 2013).
Physical Comfort	Attention to ergonomics (Zhang & Barrett, 2009).
Olfactory Comfort	Smells to be avoided/invited (Barrett et al., 2015).

Table 3. Comfort in the school environment (Source: Author).

2.6.2 Create Opportunities for Attention Restoration and Stress Reduction in Schools

The relevance of salutogenic design from the point of view of school efficiency can be better understood if we are aware of the two types of attention systems. Kaplan and Kaplan (1989) developed the 'attention restorative theory', which stated that activities needing direct attention may cause exhaustion after an intense period of concentration. A person may need to restore their attention after a period of continued concentration to be efficient. In a classroom where children are expected to concentrate on their lessons for hours together, it becomes crucial to restore attention after a certain period of direct concentration. It is now known that an exhausted person often commits human errors (Dilani, 2008). A child's ability to focus has a direct impact on their academic competence and ability to comprehend situations and stay inspired. This further leads to high self-esteem and better manageability. Studies by Amicon et al. (2018) and Determan et al. (2019) have provided the evidence that natural environments in schools can help students with better recovery of their attention resources, as well as in feeling more restored and less stressed and fatigued, as claimed by Ulrich et al., (1991) in the 'stress reduction theory'. Empirical studies have informed us that experiences of the natural environment provide greater emotional restoration, with lower instances of tension, anxiety, anger, fatigue, confusion, and total mood disturbance than urban environments with limited characteristics of nature (Barton & Pretty, 2010).

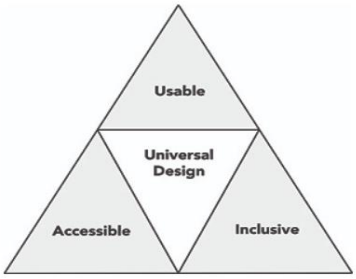
2.6.3 Design Flexible Spaces Capable of Quick Adaptation in Changing Scenarios in the Education System

To foster efficiency, spaces should be flexible to accommodate a variety of purposes, allowing day-to-day changes as well as adaptability to future change (Nair & Fielding, 2009). Designing flexible environments could enable the adoption and adaptation of the emerging changes in education. Flexibility in space allows the use of multiple modes of learning., As Howard Gardner suggested that each child learns differently depending upon their unique intelligence (Gardner & Hatch, 1989). Therefore, flexible and adaptable building designs 'future-proof' the spaces and allow for a variety of uses at different points in time (Cardellino et al., 2009).

2.6.4 Improve Accessibility and Inclusion through the Application of Universal Design Principles to Heighten Self-Esteem and Efficacy

Universal design is much more than mere removal of barriers; it intends to remove discrimination through design and encourage complete participation by all members of a community. The goals of universal design given by Steinfeld and Maisel (2012) demonstrate its health promoting intentions by ensuring an accessible, inclusive, and usable environment for all users, making a positive impact on self-esteem and self-efficacy in children.

Figure 6.0



Note. From "Equal Access: Universal Design of Student Services." Sheryl Burgstahler, 2010, University of Washington. https://www.washington.edu/doit/equal-access-universal-design-student-services

2.6.5 Encourage Participatory Planning to Build Environmental Stewardship

Childhood is the best time to inculcate environmental stewardship in children. A sustainable school environment can become a significant instrument and a potent third teacher (Strong-Wilson & Ellis, 2007) for environmental education and stewardship. Architects can either encourage participatory planning during the design and conception of the school or can leave room for intervention by children when they use the environment, which is not only a place where education is imparted but a place where learning happens (Tasci, 2015).

2.7 Meaningfulness in The School Environment

Krause (2011) observed that the motivational and emotional component increases when children can influence and take part in social decision-making processes (sense of purpose). Children need to feel that they belong to the school and school belongs to them. Based on research data from neurobiology and resilience studies, experiencing a minimal amount of empathic resonance is a fundamental biological need, without which the human being could not survive. If children feel accepted and acknowledged, they feel recognised and get feedback, which strengthens their self-worth. According to Hughes, Willis, & Franz, an environment that motivates children's desire for a sense of coherence is perceived to be meaningful. Such environments are 'inspiring, engaging, restoring, challenging, and aesthetically rich' (2019). Natural and built environments that engage the senses through material qualities of 'colour, texture and pattern' and atmospheric qualities of 'light, temperature, and sound' are important in this context. Alongside the natural elements, several other additions can make an environment meaningful, such as music, art, culture, gym, spaces for social support, and the opportunity to interact with other species, i.e., pets and other positive distractions (Dilani, 2008). A meaningful environment must, therefore, be able to evoke feelings of belongingness (self-worth) and engage people positively so that they experience a sense of purpose. We can inculcate these two qualities in the school environment in the following ways:

2.7.1 Create Opportunities for Social Interaction in a Natural Environment

The social structure and its physical environment determine, to a large extent, the kinds of experiences children have and what they learn about the world. Every aspect of child development involves socialisation (Day, 2007). Socialisation facilitates identification with the school building

and makes acceptance possible. Its users must feel connected to the school, feel at ease in it, and consider it a kind of home. A sense of place makes people connect with their surroundings and makes them establish knowledge of and appreciation for the location. Lefebvre's work is significant because it challenges the unidirectional theory between physical space and social relations. In this work, he claims that space is socially produced, engineered, and constructed and that social relations are always made up relative to space (Lefebvre & Smith, 1991). McGregor (2004) refers to schools as being a 'physical container for social life' in that they function as an intense place involving social interaction.A natural environment with 'biophilic' considerations is highly effective in enhancing the feelings of belonging and, hence, a sense of place. Some key elements of biophilic design, according to Salingaros (2015), are light, spatial permeability, sensory engagement, liminal spaces, organic shapes and forms, natural processes, and patterns such as fractal geometry.

2.7.2 Create Sensory Rich and Actively Engaging Environments to Foster a Sense of Purpose

Pallasmaa stated, "Experience of architecture is multisensory; qualities of matter, space, and scale are measured equally by the eye, ear, nose, skin, tongue, skeleton, and muscle. Architecture strengthens [...] one's sense of being in the world, essentially giving rise to a strengthened experience of self." (1996). Day (2007) stated that stimulus is essential to a healthy life. According to him, for peaceful but invigorated balance, human beings need both sameness/predictability and contrast/stimulus. Perceived risk and stimulus of new challenges are what children need to stay motivated. These are essential ingredients for developing self-esteem and fostering a sense of purpose. Day insists that children cannot develop resilience without facing their fears (2007). Risk-taking, therefore, becomes essential to developing an acute sense of coherence. Children love adventure, but their safety is a major concern. It is, therefore, important to maximise challenge while minimising injury risk. The designer must provide these whilst keeping actual risk. This is believed to be achieved through the design of environments that accommodate a wide range of sensory experiences and activities and that include many types of learning: intellectual, physical, practical, social, emotional, spiritual, and cultural (Building Futures, 2004).

Table 4

Experiences that can lead to positive emotions	**Spatial considerations in school design (lifestyle) capable of supporting experiences that may lead to positive emotion**	**Positive emotions leading to improved SOC**
Sense of security, knowing, and freedom	**i)** Give reassurance and build orientation through legible and predictable design. **ii)** Encourage autonomy and psychological freedom in the school environment.	Security/Joy Confidence

Sense of self-efficacy and balance	**iii)** Ensure comfort and safety to increase efficiency in school. **iv)** Create opportunities for attention restoration and stress reduction in school. **v)** Design flexible spaces capable of quick adaptation in the changing scenario of the education system. **vi)** Improve accessibility and inclusion through the application of universal design principles to heighten self-esteem and efficacy. **vii)** Encourage participatory planning to build environmental stewardship	Mastery Relaxation/Peace Enthusiasm Acceptance Capability/Competence
Sense of place and purpose	**viii)** Create opportunities for social interaction in the natural environment. **ix)** Create sensorially rich and actively engaging/challenging environments to foster a sense of purpose.	Belonging Curiosity/Awe

Note. Table 4: Emotion, Experience & Lifestyle in school (Source: Author).

Table 4 illustrates how positive experiences in school, reinforced with suitable environmental conditions, can help children create positive emotions that may further result in an improved sense of coherence. We can further convert the nine spatial considerations derived by critically reviewing the literature related to holistic health and the built school environment into a practically applicable design criteria matrix, including design criteria with an intention to form the basis for a healthy school design. This exhaustive matrix lists 36 design criteria for improving holistic health in the school environment. Although this matrix can be used as a ready reference for examining the health status of existing schools and a basis for new schools, the components of the matrix could be made more specific to suit the various contexts of its application.

3.0 Conclusion

The above discussion leads to the conclusion that the experiences of children in a salutogenic school environment affect their ability to create positive emotions that may lead to an increased sense of coherence and, hence, improved holistic health. The nine vital considerations under the umbrella of salutogenic design (see Table 4) can lead to effective and elaborate design criteria for schools from the point of view of health promotion. Applying the Matrix of Design and Health (Dilani & Yeang) to the salutogenic school environment, a detailed list of design criteria that affect the holistic health of children has been derived by the author (Ref. Tables 5.1,5.2 &5.3).

Further research could quantify the impact of these design considerations by conducting post-occupancy evaluations (POE) of existing school facilities where proposed interventions aim to resolve the site/community/city-specific issues related to holistic health in children. The POE may comprise of observation (of students) by the architect, as well as interviews and questionnaires (for teachers). There are various methods of POE in schools, such as Sanoff's (2001) school-building assessment methods; Tanner's 'Effect of School Design on Student Outcomes' (2008); Cohen, Gilbert, Bordass, and Leaman's 'Assessment of Building Performance in Use: PROBE Process's (2001); and Leaman's and Bordass's 'Assessment of Building Performance in Use: PROBE Occupant Survey and Their Implications' (2001). These evaluation tools can become the important foundation upon which a more comprehensive assessment method can be built, to measure the impact of the physical school environment on the holistic health of children.

The design criteria illustrated in Tables 5.1,5.2 & 5.3 must be considered by school architects and facility planners during the conceptualisation of new school facilities and the renovation of existing school buildings. The pictorial representation of the criteria make them more accessible to both professionals and laypersons involved in the school design decision-making process. As these ideas get scaled up, they will benefit vast swaths of the student population in countries around the world, by creating salutogenic school environments that promote the overall health and well-being of children and, by extension, society as a whole.

Table 5.1,5.2, 5.3: Conclusive Matrix of Design and Health with psychosocial design factors (that prevent stress) on the horizontal axis and health promoting factors (SOC) on the vertical axis within the context of the salutogenic learning environment. (Source:Author)

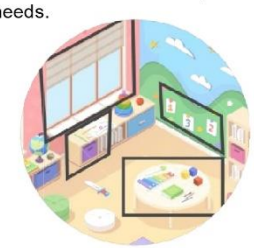
SOC Prevent stress — COMPONENTS OF HEALTH PROMOTION	PSYCHOSOCIAL DESIGN FACTORS		
COMPREHENSBILITY "World is understandable"	**LIFESTYLE**	**EMOTION**	**EXPERIENCE**
	Improve **LEGIBILITY** by creating unique identity of each block. 	Build **CONFIDENCE** through natural surveillance (esp corridors& toilets) to counter bullying. 	**WELCOMING** entrance, inviting, friendly and not institutional-looking or forbidding 
	WAY FINDING through clear sightlines and use of landmarks.. 	**SECURITY** through transparency. ex. Landscaping and trees must be carefully chosen to not block sightlines. 	**VISUAL ORDER** through limited and clear navigational choices. 
	PRIVACY through provision of retreat areas in classroom or in corridors to observe others and be alone as well. 	**AUTHENTICITY & HONESTY** conveyed through use of natural materials and construction. 	Create **HOMELIKE** environment by using familiar elements. 
	Safe Community involvement through **ACCESS CONTROL**. 	Foster **AUTONOMY** by designing places with respect for scale and developmental needs. 	**TERRITORIALITY** to value personal space ex. Home base for every student (LOSD). 
			© Parul Minhas & Anant Krishna (May 2021)

Table 5.1: Design criteria with a view to strengthening comprehensibility in children.

SOC Prevent stress

COMPONENTS OF HEALTH PROMOTION

MANAGEABILITY

"Resources to meet needs"

PSYCHOSOCIAL DESIGN FACTORS

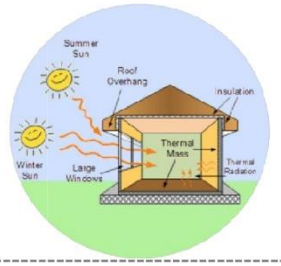
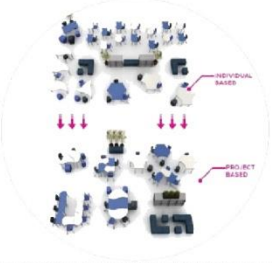
LIFESTYLE	EMOTION	EXPERIENCE
ERGONOMIC DESIGN for posture correction and efficiency in class room 	**REDUCE** learners' **STRESS** by the use of colours to facilitate vision and create a pleasant atmosphere and mood 	Create **BUFFER ZONES** from outside traffic and large school playgrounds to reduce noise disturbance 
SUSTAINABLE / energy Efficient /**VERNACULAR** architecture to foster sustainable lifestyle. 	Ensure **COMFORT** in the Interior environment so children can concentrate on the task at hand ex thermal and acoustic 	Opportunities of **ACCESSING GREEN ENVIRONMENTS** in break periods in order to rejuvenate. 
Improve accessibility and safety through the use of **UNIVERSAL DESIGN** principles 	**VISUAL STIMULI** by student work display fuelling better performance 	Participatory planning to boost **SELF EFFICACY** and competency. 
BUILD COMPETENCE through flexible spaces suited for multiple modes of learning 	Allow **NATURAL LIGHT** into the classroom to uplift the mood and improve efficiency 	**ATTENTION RESTORATION** through outside / green views to allow minds and eyes to take a break. 

Table 5.2: Design criteria with a view to strengthening manageability in children.

SOC Prevent stress — COMPONENTS OF HEALTH PROMOTION	PSYCHOSOCIAL DESIGN FACTORS		
	LIFESTYLE	**EMOTION**	**EXPERIENCE**
MEANINGFULNESS "Life makes sense"	Let **CULTURE REFLECT** by Using local materials and signature elements 	**LEARNING COMPASSION** by spending time with pets in the school garden. 	**AGENTIC LEARNING** environment to fuel belongingness 
	Inspiration through **ENGAGING** and well designed **LIBRARIES**, performing /visual art areas 	Developing **EMPATHY** for other children through informal interactions 	**STIMULATING ENVIRONMENTS** appealing to all senses ex. falling water sound 
	Intimate scale green spaces for positive **PEER INTERACTION** 	**AESTHETIC RICHNESS** through materials and furnishings in order to refresh and reflect 	**BIOPHILLIC DESIGN** to experience proximity to nature 
	GYM and playground for **PHYSICAL FITNESS** and mental strength 	**SENSE OF PLACE** through display of student artwork in corridors and waiting areas 	**RISK TAKING OPPORTUNITIES** (perceived) to experience sense of adventure 

Table 5.3: Design criteria with a view to strengthening meaningfulness in children.

Acknowledgements

We gratefully thank Professor Alan Dilani (PhD Architect/Public Health, Founder of International Academy of Design & Health) for his constant guidance and support throughout the development of this research. His commitment to salutogenic design makes him a pioneer in this field. We thank Ar. Prakash Nair [Founding President & CEO of Education Design International] for his practical and innovative ideas that have been a source of constant motivation since the very beginning of this research. His work, The Language of School Design, is a bible for young architects.

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