

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/27472304>

# Interior Design from an Integrative Health Systems Perspective Reveals the 'Hidden Dimension'

Article · January 2007

Source: OAI

---

CITATIONS

0

---

READS

291

3 authors, including:



**Jill Franz**

Queensland University of Technology

73 PUBLICATIONS 409 CITATIONS

[SEE PROFILE](#)



**Dianne Smith**

Curtin University

75 PUBLICATIONS 396 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



Environmental Interpretation and Meaning: Architecture and Interior Design [View project](#)



Sustainable Rural Development - a community centric approach [View project](#)

**This is the author-manuscript version of this work - accessed from <http://eprints.qut.edu.au>**

\*Suresh, M; Franz, J; Smith, D. 2007. Interior Design from an Integrative Health Systems Perspective Reveals the 'Hidden Dimension'. In *Proceedings At Risk Conference*, Wellington, New Zealand.

Copyright 2007 (please consult author)

---

## **Interior Design from an Integrative Health Systems Perspective Reveals the 'Hidden Dimension'**

Mini Suresh, Dr Jill Franz, and Dr Dianne Smith  
Queensland University of Technology, Australia

### **Abstract**

The places and spaces that we inhabit on a day to day basis elicit powerful emotional responses that influence our health and wellbeing. In response to this notion, the paper describes emerging research that focuses explicitly on the relationship between emotional responses and health and wellbeing. More significantly it does so from a holistic perspective relying on an integrated health systems model. Exploring the implications for interior design, the paper presents a basic understanding about 'person' as a whole and how various systems of the human body are interrelated and connected to 'emotion' and how the well-being of a person as a whole should be considered in relation to the built environment and its various elements. The paper argues that failure to consider the interrelated and integrative nature of the human body and the dialectic nature of the person-environment relationship severely restricts the potential of interior design to make an enduring positive impact on emotional health and well-being.

### **Introduction**

The places and spaces that we inhabit on a day to day basis elicit powerful emotional responses that influence our health and wellbeing. In many situations the impact of our surroundings on our emotions is expected and accepted even when the impact is negative. But what about situations where the interaction or the responses from encounters with the physical environment lie just below the surface, a fraction beyond our reach, so elusive that we fail to notice the difference; situations where there is a less obvious follow-on effect to and through other dimensions of well-being. What is the risk to design and the health of a space's occupants if this integrative aspect of person-environment interaction is ignored? For example, there may be times when we do not acknowledge or are not even aware of our inner conflicts or responses towards the space we are in because of the necessity to focus on the events, activities or tasks we are faced with. Not knowing the psychological and physiological impact of the built environment on the building users poses a risk for the people who are responsible for the design of the space. Design-education institutions need to address this aspect of the BE (built environment) and incorporate awareness of such environmental impacts on health outcomes during the learning process to avoid perpetuating the risk for future users of space.

In response to the above questions, this paper describes emerging research that focuses explicitly on the relationship between psychological (emotional) responses and health and wellbeing connected to an in-depth literature review covering a wide range of scholarly literature<sup>1</sup>. The person and environment relationship is examined as a whole using a transdisciplinary integrated health systems model. The transdisciplinary dimension acknowledges various qualities of the BE and their impact on human health and wellbeing. This dimension is related to the 'elusive' aspect or 'below the surface' characteristics as highlighted previously. These aspects when not given much notice may contain a high risk factor for design endurance. If design does not influence positive responses, it fails in its obligation of having minimal harmful effect on human health in the long term. As emotion is the trigger for the release of other ensuing physical responses, physical environmental elements influencing emotion is seen as a high risk category.

Most of us do not realise the smaller effects our surroundings may have on us while we are dealing with far more important issues. The sensations that occur as soon a person comes in contact with the BE are swift and sometimes unrecognised. However, they influence the person's perceptions and cognitive capabilities. They also evoke certain emotions and feelings in people. These emotions may cause certain physiological outcomes as well, such as affecting neuroendocrine and immune systems in the process<sup>2</sup>. People exposed to physical environments that are incompatible to their needs may be at risk if they are unaware, and therefore do not intervene.

In consideration of this, an integrative model which looks at person and environment as a dialectic whole is essential. A basic understanding of such a model is presented here enabling the construct of the person (P) to be understood more deeply and purposefully. In living beings, psychological reactions influence the neuroendocrine system thereby, affecting the immune systems which may concurrently elicit positive or negative health and wellbeing issues<sup>3</sup>. The BE also consists of various facets such as physical, psychological, and social dimensions<sup>4</sup>. Environmental situations may involve one or all of the aspects that evoke specific responses in people; thereby being causal in eliciting several psychological or emotional reactions that influence physiological outcomes. This will be explored in detail in the following sections.

### **Integrated health systems: the interior environmental concept**

While previous research implies a relationship between a holistic understanding of human health and well-being and the environment, the extent or specific nature of this understanding of how the notions of health, well-being, and environment are integrated and conceptualised, is not always clear. Design contributes to a large extent towards responses derived from person environment interaction. This implies that it may be important in such inquiry to both understand the person as a whole and the built environment to be considered in its entirety.

Integrated health systems when integrated with the physical environment reflect and support the concept that the physical environment is a key influence in maintaining human

---

1 Suresh (2007). Mapping Interior Environment and Integrated Health Systems Research Using the Psychoneuroimmunological (PNI) Model.

2 Ader et al. (1991). Psychoneuroimmunology 2nd Ed.

3 Schedlowski & Tewes (1996). Psychoneuroimmunology: An Interdisciplinary Introduction.

4 See Bell, et al. (2001). Theories of Environment-Behaviour Relationships (5th ed.).

health and wellbeing. As stated previously, the model<sup>5</sup> was developed as part of a larger study which looked at BE and health research using a transdisciplinary approach. 'Integrated health' refers to the transactions between the mental state and physical state resulting in either positive or negative well-being. It acknowledges the physiological responses and reactions that the psychological responses can elicit and then consequently influence health and wellbeing in the process. The person is conceptualised as a whole according to this understanding. Using an integrative approach, people and environments cannot then be viewed in isolation. On the other hand, the different aspects of the environment cannot be separated from one another; as PE relationships they interact and transact within themselves, eliciting different reactions from the person as s/he experiences place. In other words, they cannot be "defined independent of the other"<sup>6</sup>.

For interior designers, the integrative model is particularly relevant due to the intimacy of the relationship of the person and the interior environment; the way in which people interact with the environment and vice versa is of concern as design solutions are developed with the human element as a main criteria. As Abercrombie<sup>7</sup> proposes, the designer should:

"...be attuned to that person's tastes, habits, mental sensibilities, and psychological susceptibilities...the designer must not forget the more obvious fact that the person also has a body...our body is also the key instrument in the art form of interior design"<sup>8</sup>

In general, several factors are of relevance to designers, in order to develop a more comprehensive understanding of the relationship between built environment and holistic health and well-being as they influence each other.

### **Understanding the 'whole person'**

As argued the interrelationship between the various systems of the human body and their connection to 'emotion' and consequently the well-being of a person as a whole should be considered when designs for human inhabited built environment are regarded. An increasing number of studies have documented the connection between mind and the body<sup>9</sup>. Similarly, there have many studies that document the connection between the mind and the body where illnesses are shown to have developed through mental stress and strain<sup>10</sup>. Cancer, arthritis, asthma and cardiac illnesses are only some of them. If one's psychological/emotional health is depressed, the physical body could be more susceptible to illnesses. Accordingly, the interactions between the psychological systems, the central nervous system (CNS) and the neuro and endocrine systems are included as they also are understood to affect the immunological systems of the body. For instance, the experiences of stress can result in the production of an excess amount of epinephrine (adrenaline), causing a chemical breakdown resulting in the internal weakening of the immune system,

---

5 Suresh et al. (2006). Person Environment Relationships to Health and Wellbeing: An Integrated Approach.

6 Ittleson (1976), Environmental perception and contemporary perceptual theory. p.56.

7 Abercrombie (1990). A Philosophy of Interior Design.

8 Abercrombie (1990). A Philosophy of Interior Design. p. 164.

9 Cousins (1983). The healing heart.

Ader et al. (1991). Psychoneuroimmunology 2nd Ed.

Hafen (1996). Mind-Body Health. The effect of attitudes, emotions and relationships.

10 Wheatly (1994). Medical implications of stress. Human stress and the environment.

and an increased potential for disease<sup>11</sup>. Thus emotions are responsible for creating havoc within the human body and being responsible for many illnesses and diseases.

Wheatly<sup>12</sup> has described in length the impacts of stress on various physiological conditions. These include blood pressure, which may escalate due to high levels of hypertension, certain psychiatric disorders such as phobias and panic disorders, and depression arising from exposure to prolonged chronic stress. He also suggests that many infectious diseases and life threatening illnesses like cancer can also manifest due to stress; for example, students who faced failure or more disappointments in life were diagnosed as having sore throats, and those with prolonged sadness with acute respiratory illness. This is because people under stress are more susceptible to the impairment of the immune system thereby potentially increasing their vulnerability to infectious diseases. Recovery is also slower under stressful conditions. Environmental situations that contribute to stress may thus be responsible for a multitude of illnesses and diseases.

The studies regarding human systems show psychological and physiological systems cannot be separated. Reactions and responses that a person derives from environmental relationships should not be separated and should be understood in terms of further reactions that can occur. Risk increases if they are ignored.

### **Person environment interaction on health and wellbeing**

With this understanding, the paper now focuses on the relationships that a person forms with the physical environment and their contribution to positive or negative health and well-being outcomes or, in other words, the efficacy or inefficacy of the BE on health and wellbeing. To identify the current understanding of the environmental responses, it is of value to explore research literature in the BE and, to some extent, health research as well. The findings about the PE relationship principles can be shown to aid the linkages of 'person' and BE to encompass an integrative picture.

The theoretical concepts as well as empirical research related to psychological, social, and physiological aspects of PE relationship are relevant as they support the argument that the BE and the emotional changes generated may be associated with instigating conditions related to poor physical health and well-being. They also help describe the various attributes of an integrative health systems model. Environmental behavior research indicates that studies on PE relationships have mainly focused on the psychological and social aspects of PE interaction and transaction. Several key PE relationship dimensions have been proposed as ways to understand and explain environmental behaviours, responses and experiences, such as spatial use, environmental privacy and control practices, other experiential behaviours, preventive health factors connected to the environment (such as 'sick building syndrome'), importance of aesthetic qualities, and design for human physical activity<sup>13</sup>. Most concepts have sought to explain PE relationship as a result of the interaction/ transaction of a collection of factors.

---

11 Tewes (1996). Concepts in Psychology.

12 Wheatly (1994). Medical implications of stress. Human stress and the environment.

13 Zeisel (2006). Inquiry by Design: Environment/Behavior/Neuroscience in Architecture, Interiors, Landscape and Planning.

Bell, et al. (2001). Theories of Environment-Behaviour Relationships (5th ed.). pp. 98-135.

Underlying the premise of the integrative system approach is that if we are to really understand the consequence of person-environment relationship in relation to human health and well-being, we need to regard the person and their psycho-physiological systems in a collective sense. In general, however, a person's psycho-physiological relationships with the BE, particularly emotional and mental relationships and their influence on the physiological systems, are less studied in physical environment research<sup>14</sup>. As Parsons & Tassinari<sup>15</sup> state from the perspective of environmental psychophysiology, "All psychological events have some physiological referent - there is no entity called mind that is independent of the central nervous system". Some theories in environmental psychology such as those related to environmental stressors, restorative environments, topographic cognition, environmental aesthetics, isolated environments, and restricted environmental stimulation therapy, indirectly imply that psychological events have some 'physiological referent'<sup>16</sup>.

### **Considering person and the built environment in the integrated sense**

The failure to consider the interrelated and integrative nature of the human body and the dialectic nature of the person-environment relationship may severely restrict the potential of interior design to make an enduring positive impact on emotional health and well-being. Design impacts on people using place and space<sup>17</sup>. It facilitates or impedes quality of life in several ways. Among them is the health and wellbeing of the person. For a person to enjoy quality of life, it is vital to be healthy in all aspects<sup>18</sup>. If these issues are not considered, a certain risk factor exists which may or may not be evident. The interaction with space could elicit certain responses in people in such a way that they may influence emotions consequently triggering physiological reactions. This may further affect health and wellbeing therefore being harmful at certain stages. While some responses are recognised by users, some are not as evident.

Previous research shows that most of the work in attempting to understand the influence of the physical environment on health and well-being in humans has focused on physiological and stress factors. Frumkin<sup>19</sup> states that environmental health being dynamic in nature encourages interdisciplinary as well as transdisciplinary research, rather than trying to concentrate on one discipline to conceptualise relationship between human-health and the environment. It is thus important to consider interdisciplinarity as well as transdisciplinarity in design applications. In the design context for example, interdisciplinarity inquiries into design implications should include understandings of interdisciplinary areas such as environmental psychology and so on while transdisciplinarity studies could be informed through collaboration from science and medicine. Transdisciplinarity uses knowledge from the disciplines working together informing inquiries without any 'boundaries'<sup>20</sup>.

The aspects of the user's and creator's influences indicate that the making of a place and its use are interrelated to our experience and inter/transactions; designer, researcher and

---

14 Korpela & Ylen (2005). Perceived health is associated with visiting natural favourite places in the vicinity.

15 Parsons & Tassinari (2002). Environmental Psychophysiology. P.174

16 Parsons & Tassinari (2002). Environmental Psychophysiology.

17 Stokols (1998). Environmental Design. Psychosocial and Organizational Factors.

18 Butler & Jasmin (2000). Longevity and Quality of Life: Opportunities and challenges.

19 Frumkin (2005). Introduction. Environmental Health: From Global to Local.

20 Smith et al. (2005). Designing together: a collaborative experiment in design methodology within a multi-disciplinary environment.

user categories influence and manipulate each other in a multifaceted way<sup>21</sup>. While this is exemplified by the notion that the designer is responsible for the users' experience, it may be important to note that if creators ignore the factors responsible for human health and wellbeing responses, they may be complicit in creating health hazards for people using the environment they created.

Ulrich<sup>22</sup> believes that humans respond immediately, unconsciously, emotionally and physiologically. These processes play a critical role in how humans respond to the physical environment, its configurations and elements. These concepts relate to the person environment interrelationship integrative health systems model, which gives precedence to the emergent human subjective and objective reactions due to spatial inter/transactions. Furthermore, Pennebaker & Brittingham<sup>23</sup> state that certain environmental stimuli can elicit physiological responses influenced by psychological responses. They state that, when there is 'external information' (stimuli outside the human body), the 'internal sensation' creates awareness of it which is "directly related to physiological change", these perceptions evolving either consciously or without deliberation. People may not be aware of the internal physiological sensations unless it is something contradictory to everyday encounters. The main risk factor that may be involved here is the fact that the responses and reactions may sometimes be unknown to the user. This signifies the importance of the designer in implementing certain standards to design applications so that it would positively elicit responses.

Exposures to everyday environments may elicit various effects on human psychological and physiological systems<sup>24</sup>. Ulrich's<sup>25</sup> experiments measure the person's physiological and psycho-physiological responses (such as muscle tension, brain waves, heart rate and blood pressure) when experiencing the physical environment. His results indicate that preferred environments reduce anxiety and enhance recovery process and stress responses. Such studies suggest that the environment consists of several stimuli that influence the psychological and physiological responses in humans.

Although generalisations can be found within each area of research, it is still helpful to identify general patterns crossing over environmental perceptions, cognitive and emotional responses, preferences, cultural influences and therapeutic and restorative qualities of the occupied space, to understand their influences on health outcomes. It may well indicate that the results found for one particular group may apply to other groups and that no single study by itself can be conclusive. However, as numerous studies provide similar understandings and concepts, they indicate that direct and indirect effects may exist. Emotion feature repeatedly in research concerning person environment interaction, pointing out that feelings play a role in human psychological and physiological responses to place and that the physical environment can directly affect or alter emotions.

## Conclusion

This paper identifies some specific risk factors , that is negative health and wellbeing

---

21 Canter (1997). The Facets of Place. p. 112.

22 Ulrich (1983). Aesthetic and Affective Response to Natural Environment.

23 Pennebaker & Brittingham (1982). Environmental and sensory cues affecting the perception of physical symptoms. p.119.

24 Ulrich et al. (1991). Stress recovery during exposure to natural and urban environments.

Ulrich et al. (2004). The role of the physical environment in the hospital of the 21st century.

25 Ulrich (1981). Natural versus urban scenes: Some psychophysiological effects.

outcomes such as stress resulting in high blood pressure, respiratory illnesses and so on. For example stress could be triggered off as a result of overlooking the underlying elements of our surrounds. Psychological or more specifically emotional wellbeing of a person influences health and wellbeing thereby affecting quality of life. Several studies have provided basis for such an understanding. As research also indicates that the built environment contributes to positive as well as negative psychological wellbeing, the possibilities of health issues in relation to the environment we interact in is equally important. Thus, design affects people on all aspects of psychological and physiological wellbeing influencing health and quality of life.

Transdisciplinary research may be key in exploring such relationships. This is demonstrated by current research synthesised to develop an integrative model<sup>26</sup>. This would have been impossible had other studies outside interior design been ignored. The element of person was understood in total only after including understandings of person in a medical or scientific way. Such studies contribute to an understanding of a person as a whole and the built environment in finding applicable design solutions.

Taking this into consideration it is recommended that further research into illnesses caused by environmental impact on emotional wellbeing and consequences on the neuroendocrine and immune systems is necessary. Also further exploration into the benefits of applied linkages between person's integrative health systems and the physical environment practice would provide a better understanding for application into practice and the production of a positive environment where distress and the potential for illness and disease are minimised.

Educational institutions should also emphasise the importance of transdisciplinarity in all areas of application and give further importance to research and education in such domains by collaborating across a number of disciplinary faculties. Other than a handful of programs such as environmental health, public health, and environmental psychology (which concentrate on the health aspects related to the physical environment), architecture and design disciplines do not necessarily look at these integrative elements of applied design for human health. By including design projects that embrace the integration of students from other disciplines such as psychology, nursing and so on. Design students also could be introduced to the psychological and physiological workings of the human body helping them to find better design solutions that positively influence users. It is our aim that given a tool such as the integrative health model, design students could develop a broader and more grounded knowledge about the health of the users of their design without compromising their creativity.

## References

1. Suresh, M. (2007). Mapping Interior Environment and Integrated Health Systems Research Using the Psychoneuroimmunological (PNI) Model. Research Masters Thesis, pp. 2-5. Queensland University of Technology. Australia.
2. Ader, R.; Felten, D.L.; & Cohen, N. (1991). *Psychoneuroimmunology* 2nd Ed, p. 617. Academic Press, San Diego.
3. Schedlowski, M & Tewes, U (Eds). (1996). *Psychoneuroimmunology: An Interdisciplinary Introduction*, pp.1-340. Kluwer Academic. Plenum Publishers.
4. Bell, P.A.; Greene, T.C.; Fisher, J.D.; & Baum, A (Eds). (2001). *Theories of*

- Environment-Behaviour Relationships (5th ed.)*, pp. 52-68. Harcourt College Publishers.
5. Suresh, M.; Smith, D.; Franz, J. (2006). Person Environment Relationships to Health and Wellbeing: An Integrated Approach, p. 95. *IDEA Journal*. Queensland University of Technology, Australia.
  6. Ittleson, W.H. (1976). 'Environmental perception and contemporary perceptual theory' in Proshansky, H.M., Ittleson, W. H., Rivlin, L.G. (Eds), *Environmental Psychology: People and their settings* (2nd ed), p. 56. New York: Holt, Rinehart and Winston.
  7. Abercrombie, S. (1990). *A Philosophy of Interior Design*, p. 164. New York: Harper & Row.
  8. Abercrombie, S. (1990). *A Philosophy of Interior Design*, p. 164. New York: Harper & Row.
  9. Cousins, N. (1983). *The healing heart*, pp. 162-174. New York: Avon books.
  - Ader, R.; Felten, D.L.; & Cohen, N. (1991). *Psychoneuroimmunology* 2nd Ed, p.1. Academic Press, San Diego.
  - Hafen, B.Q.; Karren, K.J; Frandsen, K.J; & Lee, S.N. (1996). *Mind-Body Health. The effect of attitudes, emotions and relationships*, pp. 1-48. Allyn and Bacon Massachusetts.
  10. Wheatly, D. (1994). 'Medical implications of stress. Human stress and the environment', in J.Rose (Ed), *Environmental topics- vol 5*, p. 5-20. Philadelphia: Gordon and Breach Science Publishers.
  11. Tewes, U. (1996). Concepts in Psychology, in Manfred Schedlowski & Uwe Tewes, ( Eds). *Psychoneuroimmunology: An Interdisciplinary Introduction*, pp. 93-111. Kluwer Academic. Plenum Publishers.
  12. Wheatly, D. (1994). 'Medical implications of stress. Human stress and the environment', in J.Rose (Ed), *Environmental topics- vol 5*, p.1. Philadelphia: Gordon and Breach Science Publishers.
  13. Zeisel, J. (2006). *Inquiry by Design: Environment/Behavior/Neuroscience in Architecture, Interiors, Landscape and Planning*, pp. 141-226. W.W.Norton & Company: New York.
  - Bell, P.A.; Greene, T.C.; Fisher, J.D.; & Baum, A (Eds). (2001). *Theories of Environment-Behaviour Relationships (5th ed.)*, pp. 98-135. Harcourt College Publishers.
  14. Korpela, K. M. & Ylen, M. (2005). Perceived health is associated with visiting natural favourite places in the vicinity. *Health & Place*, pp. 1-14 (In Press).
  15. Parsons, R & Tassinary, L.G. (2002). 'Environmental Psychophysiology', in Robert Betchel and Arza Churchman (eds). *Handbook of Environmental Psychology*, p. 174. John Wiley & Sons, Inc., New York.
  16. Parsons, R & Tassinary, L.G. (2002). 'Environmental Psychophysiology', in Robert Betchel and Arza Churchman (eds). *Handbook of Environmental Psychology*, p. 174. John Wiley & Sons, Inc., New York.
  17. Stokols (1998). Environmental Design. Psychosocial and Organizational Factors, pp. 19-23. In *Encyclopedia of Occupational Health and Safety*. 4<sup>th</sup> Edition. Jeanne Mager Stellman (Eds). International Labour Office Geneva.
  18. Butler & Jasmin (2000). Longevity and Quality of Life: Opportunities and challenges, pp. 1-3. *Proceedings of the Congress Worldwide Revolution in Longevity and Quality of Life*. Robert N. Butler and Claude Jasmin (Eds). Kluwer Academic/Plenum Publishers, New York.
  19. Frumkin, H, (Eds). (2005). Introduction. In Howard Frumkin (Eds.). *Environmental Health: From Global to Local*, pp. xl-xlv. John Wiley & sons, Inc.
  20. Smith, D, J; Sanders, P, S; Demirbilek, N; Scott, A. (2005). Designing together: a

- collaborative experiment in design methodology within a multi-disciplinary environment, p.7. In Holt-Damant, Kathi and Sanders, Paul (Eds). *Proceedings Third international conference of the Association of Architecture Schools of Australasia (AASA)*, Brisbane.
21. Canter, D. (1997). 'The Facets of Place', in Moore, G.T & Marans, R.W (eds), *Advances in Environment, Behavior, and Design. Towards the integration of theory, Methods, Research, and Utilization, Volume 4*, pp. 109-148. Kluwer Academic/ Plenum Publishers, New York.
  22. Ulrich, R. S. (1983). 'Aesthetic and Affective Response to Natural Environment', in Irwin Altman & Joachim F. Wohlwill (eds), *Behavior and the natural environment*, pp. 85-125. New York: Plenum Press.
  23. Pennebaker, J.W. & Brittingham, G.L. (1982). 'Environmental and sensory cues affecting the perception of physical symptoms', in A. Baum and L. Singer (eds.), *Advances in environmental psychology, Volume 4*, pp. 115-136. Hillside, NJ: L. Erlbaum Associates.
  24. Ulrich, R.S., Simons, R.F., Losito, B.D., Fiorito, E., Miles, M.A., Zelson, M. (1991). 'Stress recovery during exposure to natural and urban environments'. *Journal of Environmental Psychology*. 11, 201-230.
  - Ulrich, R. S.; Zimring, C.; Quan, X.; Joseph, A.; & Choudhary, R. (2004). 'The role of the physical environment in the hospital of the 21st century'. *The Center for Health Design*, pp 1-69. URL:  
[http://www.healthdesign.org/research/reports/pdfs/role\\_physical\\_env.pdf](http://www.healthdesign.org/research/reports/pdfs/role_physical_env.pdf)
  25. Ulrich, R. S. (1981). 'Natural versus urban scenes: Some psychophysiological effects'. *Environment and Behavior*. 13, 523-556.
  26. Suresh, M. (2007). Mapping Interior Environment and Integrated Health Systems Research Using the Psychoneuroimmunological (PNI) Model. *Research Masters Thesis*, p. 22. Queensland University of Technology. Australia.