WINDOW AND VIEW: A REVIEW OF THE EFFECT OF WINDOWS ON HUMAN WELL BEING IN DIFFERENT TYPES OF BUILDING

Roshida binti Abdul Majid

Abstract

Previous research in environmental psychology evidently shows that the existence of windows effect human well being where window view of nature is psychologically and physiologically beneficial to human. This paper presents the theoretical perspectives of the effects of windows on human well being through literature analysis from various research disciplines including behavioural science, architecture, landscape, planning, energy, health and computer science. The discussion is based on different types of building, namely, office, school, hospital and housing. These four types of building show significant need for windows with views of nature. The review emphasized viewing nature through windows enhances work and well being at work place. It can increase job satisfaction, interest value of the job, perceptions of self productivity and perceptions of conducive physical working condition. The windows in classroom increase satisfaction and interest among the children whereas in hospital it improves the recovery time of the patient. In the other hand, window views to nature also are highly preferred in housing for its restorative benefits and meaningful outside information. In summary, the attributes of window has significant effect on overall life satisfaction and improve the occupants' well being. Finally, this paper suggest for further work to identify the windows and views preferences in terraced houses in Malaysia.
Key words: windows, views, nature, human well being

1.0 INTRODUCTION

Window is one of the very important building elements that normally take into considerations in every building design. Traditionally, window act as sensory organ for the building to stimulate the internal spaces with natural lighting, fresh air and outside view. These window functions not just contribute to buildings physical environments but also have a psychological benefit that affects the occupants or human well being. However, the energy conscious design had over shadow the psychological needs and aspirations of building occupants. Window had seen as a medium that increase the building heat and in extend effect efficiency of its operation cost. Thus, these problems had have prompted to debase the window as an unnecessary amenity in buildings.

Further more, in many cases there are buildings that require deep planning with maximum built up to cater the need for more spaces. In fact, the current day's building technologies allow the existence of the internal rooms in the deep planning buildings and finally the windowless environment will occur. There are evidences that windowless rooms may not very desirable psychologically for the people in the buildings.

Thus, the goal of this paper is to justify the theoretical perspectives of the effects of windows on human well being through literature analysis from various research disciplines.

2.0 WINDOW AND VIEW

The basic function of windows can be categorized into the following (Markus, 1967)

- Daylight
- Sunlight
- Ventilation
- View and privacy
- Contribution to general visual character.

Those functions will determine the size and placement of windows in any buildings parallel with the function of the spaces (Butler & Biner 1997). The designs of the window may influenced by the culture and climate of certain places but the original functions are remained. Apart from the physical functions, window also has significant psychological functions. One of the most important psychological functions and always being considered by the occupants is view.

Since people usually have desire for contact with the external world, view out through the window from the interior spaces can satisfy the people's desire. The information content and dynamic properties of a view are critical in determining a person's satisfaction with windows (Verderber, 1983: Kaplan, 2004). The view quality depends on its information contents – the amount of sky, land and ground (Evans, 1980). Upwards, the sky as the dominant source of light may be important in touching with time of day and the weather changes. The predominantly horizontal view of landscape provides the maximum amount of information about the inanimate environment (Kim, 1997). The downward view of ground and activities going on upon it – traffic, rivers, playgrounds, parks, streets – comprises the basic human, social portion of the view (Markus, 1967).

The views of natural environments are generally preferred over the views of built or urban environments. Complex views are generally preferred over less complex views (Butler & Steuerwald, 1991). Closed views are preferred to distance views (Collins, 1963). A range of spatial sequences will be preferred to one class of distance (Ludlow, 1976)

3.0 WINDOWLESS ENVIRONMENT

Due to the lack of awareness on the psychological functions of window had made the windowless environment occur in some buildings. The energy related argument on window that allow undesirable heat gain and loss, together with the admission of noise and polluted air from the outside had influence the decision to terminate the window and ignore its traditional functions. The current building technologies made it possible to design spaces in the buildings that are entirely physically windowless.

In 1983, Verderber had found that the windowless environment still can occur even though physically there are windows. He identified two situations of windowless

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In 1983, Verderber had found that the windowless environment still can occur even though physically there are windows. He identified two situations of windowless

environment known as psychological windowless and architectural windowless. Both situations are related to their poor view content; psychological windowless happened when the window are having a monotonous built view such as car parking whereas architectural windowless were referred to a window blocked by a high wall. Kaplan, 2004 identify window view to the sky was not preferred by the occupants and may also contribute to the windowless environment.

These changes in the built environment gave a great impact to the humans' emotion especially the building occupants. Many studies conducted by the researches had proved the negative effect on the human well being through their findings.

4.0 RELATED RESEARCH

This paper had summarized over 43 research studies on window related to psychological issues covering the period 1961 to 2007. The review is structured according to several types of significant buildings namely, school, hospital, office and residential followed by prison and factory. This paper also identified other theoretical review on window and view in general at several building types. The details of the research summary are tabulated in the following table.

Building type	**Author (year)**	**Research Area**	**Research focus and variables**	**Research methods**	**Finding**
General / several types of buildings	Collin (1975)	Behavioural science	People reaction to windowless space in schools, factories, offices, and hospital Psychological function of window	Research review on 88 related window studies from 1959 to 1975	Windows provide many more functions for people than just sources of light and air. Window provided a view to the outside, knowledge of the weather and time of day, relief from feelings of claustrophobia, monotony or boredom, a change of focus, lent character or beauty to a room and furnished an indication of status or wealth.
	Butler & Biner (1989)	Behavioural science	Preferences for size, number and degree of transparency of windows due to specific factors at different setting/ space function	Participant self report using verbal questionnaire. Lab experiments. Case study: 14 common spaces to 59 undergrad students 18 potential factors	The size and number of window desired in each space rely on setting (function of space and how important specific factor (having a view or good ventilation)
	Radikovic, Leggett, Keyser &	Computer science	Window substitute for windowless room.	Visual graphic evaluation. Questionnaire.	Human subjects suggest that the system prototype is a better

	Ulrich (2005)		Development of new system using a head coupled display and image based rendering to simulate a photorealistic artificial window view of nature with motion parallax.		window substitute than a static image. Higher rating for realism. Acceptable for replacement.
School	Arnorld (1961)	Energy	Preference of window and natural lighting in school	Participant self report. Verbal questionnaire.	Least preferred. Large window cause over heating and glare in sunny day in UK
	Burts (1961)	Behavioural science	psychological function and preference of window in classroom	Subject self report. Questionnaire.	Psychologically window helps to promote better classroom for learning.
	Larson (1965)	Behavioural science	psychological function of window in classroom and its effect on students' performance	Psychological and behavioural observation	Window did not affect student performance. Their academic result are same both at window and windowless classroom
	Langdon and Loudon (1970)	Energy	Summer overheating: The factors responsible for thermal discomfort due to structural and design characteristic of window	Participant self report. Questionnaire.	The factors are: orientation, structural weight and occurrence of external noise near the room
	Kuller & Leindstein (1992)	Health Science	Window and light effect on stress and growth hormones.	Psychological and physical observation	More hormones growth, less stress and absent for children in windowed classroom.
	In Kon Kim (1997)	Architecture and Behavioural science	Effect of window and its psychological function (view, natural light and sunlight) on size and distribution	Participant self report. Verbal and visual questionnaire.	A number of smaller size of windows in a row providing sunlight and good view was preferred most compare to one bigger size of window with poor view.
Hospital	Wilson (1972)	Health Science	Windowless ward and its effect on patients.	Psychological and physical observation	The windowless environment develop post operative syndrome among patient that increase the treatment cost
	Ulrich (1984)	Behavioural science and landscape	Window view of a natural setting and its restorative influence to surgical patients.	Psychological and behavioural observation	Window view of a natural setting has restorative influence. Recovery time and analgesic intake of surgical patients were decrease for those patients with view of

					nature compare to windows facing a brick wall.
	Verderber (1983 & 1986)	Architecture and Behavioural science	Windowless ward and its effect on patient and staff well being	Participant self report. Questionnaire.	Windowless ward has negative effect to patient more than staff. Staff ability to move is the factor that creates this opposite result.
	Ulrich (1991)	Health Science and landscape	View through window and its effect on surgical patient	Psychological and physical observation	Recovery from stressful events appeared faster when exposed to natural rather than urban view environment.
Prison	Moore (1981)	Health Science	Windowless room and its effect on prisoner	Psychological and physical observation	Critical to prisoner and increase physical sickness and medical cost
Factory	Pritchard (1964)	Behavioural science	Reaction to windowless factory	Participant self report. Questionnaire.	No negative reaction from the workers because open plan factory has bigger space to move
Office	Wells (1965)	Behavioural science	Window preference of its psychological function, daylight and view	Participant self report. Questionnaire.	90% has the desire to look outside from the window. 69% felt daylight through window provide better quality illumination
	Markus (1967)	Behavioural science	Preference of window proximity towards view	Participant self report. Questionnaire.	Distance of the occupants from the window effected satisfaction. The greater the distance, the lesser satisfaction
	Ruys (1970)	Behavioural science	Reaction to windowless office	Participant self report. Questionnaire.	Occupants dislike windowless office especially small office. Picture is used as window substitute. Forest scene preferred over cityscape picture.
	Ne'eman & Hopkinson (1970)	Architecture and Behavioural science	View through window: minimum acceptable window size	Participant self report. Questionnaire.	Small window needed if view outside was uniformly bright and featureless. Participants prefer wider window for view of near objects than distance object.
	Nicols (1974)	Architecture and Behavioural science	Satisfaction with view content and window configuration in multi-storey office	Participant self report. Questionnaire.	Most preferred view is closest to the ground. Immediate view give experience a direct visual connection with life
	Sommer (1974)	Behavioural science	Reaction to windowless office	Psychological and physical	Occupants use landscape

				observation	poster/picture as window substitute
	Finegan & Solomon (1981)	Behavioural science	Effect of windowless work environment on job satisfaction.	Participant self report. Questionnaire.	View of nature increase worker perception of job satisfaction, interest value of the job and physical working condition.
	Heerwagen & Oriens (1986)	Behavioural science	How people in windowless offices compensate for the lack of windows in their environment.	Behavioural observation	Occupants use picture/poster as window substitute. Preference for natural over built view in the picture/poster
	S. Kaplan (1987)	Behavioural science	Windowless offices and its effect. view preferences	Participant self report. Questionnaire.	Mental fatigue (health status) occurs among the workers in windowless office. A window view of nature is preferred for its restorative function.
	Butler & Steuerwald (1991)	Behavioural science	Effects of view and room size on window size preferences made in model	Participant self report. Questionnaire.	Window preference affected by room size and quality of view. Large window is preferred in: - smaller room - scene perceived as more beautiful Window size also affected by the type of room (smaller window for computer work room)
	Boubekri, Hulliv & Boyer (1991)	Energy and Behavioural science	The effect of sunlight through window to occupants	Participant self report. Questionnaire.	Sunlight not only enhance visual, emotional and psychological well being but as a heat source.
	Biner, Butler & Windsted III (1991)	Behavioural science	Desirability of inside windows and the effect of inside windows	Participant self report. Questionnaire.	Inside windows were generally desired more of students than staff (secretaries) due to outside distraction. The size of inside window desired smaller than conventional windows for comparable spaces, but bigger if the space being viewed had conventional window.
	R. Kaplan (1993)	Behavioural science	View from the window and its impact with respect to well being	Participant self report. Questionnaire.	View of nature does influence worker perceptions of job satisfaction, interest value of the job and life satisfaction.
	Biner, Butler,	Behavioural science	How people in windowless offices	Behavioural observation	Preference for natural over built picture or

	Lovegrove & Burns (1993)		compensate for the lack of windows in their environment.		poster Additional influence of natural feature factor such as flower pot
	Stone (1998)	Behavioural science	Window and poster and its effect on individual performance, mood and perception in office	Behavioural observation	Windows did not affect performance with any task demand. But increased perception for individual with computational task. Poster presence increased positive mood and decreased fatigue perceptions for individuals performing the creative task.
	Leather , Pyrgas, Beale, Lawrence (1998)	Behavioural science	The influence of window and view on performance and mood	Participant self report. Questionnaire.	A view of nature does influence the worker perception on job satisfaction; reduce the intention to quit and buffer of strain.
	Doggart (2000)	Behavioural science	Individual control of window preference	Participant self report. Questionnaire.	Workers continue to express the desire for openable window
	Clementss-Croome and Kaluarachi (2000)	Behavioural science	Individual control of window to individual performance	Participant self report. Questionnaire.	Greater self productivity
	Wyon (2000)	Behaviour	Effect of window and view in business setting	Behavioural observation	Actual productivity increase when workers were given opportunity to individually control their window for view.
	Laumann et al. (2001)	Behaviour	View though window and its preferences	Participant self report. Questionnaire.	Preferences for natural over built views
	Farley & Veitch (2001)	Behavioural science	View though window and its effect on office worker well being	Research review on others empirical research	Most researches evidently shows window view to nature give positive effect to workers well being.
	Dogrusoy & Tureyen (2007)	Architecture and Behavioural science	The preference for windows in office spaces	Laboratory test Participant self report. Questionnaire.	The window type, gender, quality of office job and quality of view created significant differences in determining prior factors behind window preferences.
Residential	Holister (1968)	Behavioural science	• People reaction to windowless residential building	Participant self report. Questionnaire.	Even the limited use of windows in bathrooms resulted in very unfavourable reaction. Public opinion would prevent the use of windowless

					environment for habitable rooms
	Tenessen & Cimprich (1995)	Behavioural science	Window views at dormitory and its influence on students' performance on attention test	Psychological and physical observation	Students with views in the upper two quartiles of naturalness scored significantly better on three of the four attention tests. Student in the single highest vegetation group scored significantly better than even the second highest group on one attention test.
	Wells (2000)	Behavioural science	The effect of natural view from window to children cognitive functioning	Behavioural observation	Children benefit better cognitive functioning with restorative natural view
	R. Kaplan (2001)	Behavioural science and planning	How residential views of natural and built elements affect residents' satisfaction with the neighbourhood, satisfaction with their access to nature and three aspect of well being related to attention restorative theory: affective functioning, being at peace, and (not) being distracted.	Participant self report. Questionnaire using photo and verbal description. Case study: six apartment communities in Ann Arbour, Michigan with 564 household, 34% (188) return useable answer	Nature content in view from home contributes to satisfaction and well being. People most preferred windows view similar to photo of dense woods.
	R. Kaplan , S. Kaplan & Austin M. (2004)	Behavioural science and Planning	Preferences of view to nature, satisfaction with their neighbourhood and with diverse aspect of sense of well being	Participant self report. Questionnaire.	People prefer a view of a wood over a manicured lawn

5.0 DISCUSSION

This paper found a lot of research studies (16 empirical studies) done in the workplace area or office building and most of the research studies (90%) emphasize on the behavioural issue as the most important outcomes. Their studies identified viewing nature through windows enhances work and well being at work place. The result showed the existence of window and view increase job satisfaction, interest value of the job, perceptions of self productivity and perceptions of conducive physical working condition.

The following building type that is significantly contributed to the research on window and view is school. Out of six research studies, 50% discover the psychological effect of view through window to the students in classrooms. The outcomes showed the importance of window and view that increase satisfaction and interest among the children.

This paper also found four research studies on window and view in hospital. Window and view played a very important role as a healing medium in hospital environment. The most significant outcome was it improves the recovery time of the patient.

The previous and current research on window and view also can be found in residential. Window views to nature are highly preferred for its restorative benefits and meaningful outside information.

5.1 CONCLUSION AND SUGGESSION FOR FURTHER WORK

The literature shows the attributes of window has significant effect on overall life satisfaction and improve the occupants' well being at any buildings type. However, most of the building design in Malaysia seems to ignore the psychological function of the window and residential is one of the building type that facing this windows' problems.

This paper suggest for further work to identify the preferences of windows and views in terraced houses in Malaysia. Terraced house is a type of housing that is significantly found in Malaysia. Based on the statistic by Ministry of Housing and Local Government, it covers more than 50% of the total housing development of all over Malaysia until this year. This type of housing planning requires an arrangement in a long grid with limited centralised community garden. It means only few of the home buyers (normally the first comer) will have the opportunity to choose a house facing the community garden that may provide a beautiful natural scene. Whereas the others will have no choice, and like it or not they have to accept any location left. In fact based on the interview with one of the developer, normally the home buyers will allocate their house preference somewhere opposite the community garden. One of the reasons is, of course the view and closeness to the source of natural environment. Either they realise or not window play a very important role that act as sensory organs of the house to create this inside and outside interrelationship.

In other hand, the house unit mostly designed in a long plan. Thus, each of the houses will have limited wall for windows and in many cases there will be an internal room or space that allow improper window placement. Whereas the maximum built up area do not allow for individual yard for the residents to create personal garden either at the front or at the back especially the intermediate unit. It contributes to the poor quality of view where the front windows are normally facing the car porch and the rear windows will directly facing the opposite neighbours house.

Architecturally, window is a 'space-connection interfaces' that should be designed with consideration of its configuration (e.g., size, width, sill height and location) and its quality of view. Thus, both considerations should parallel with the spaces and their functions. Hence, the empirical outcomes of the suggested further study will lead to the design guidance that will help the designers, architects, planners and other professionals in designing the terraced houses emphasizing the quality of windows and views. Finally, the research will contribute to more choices of patterns of terraced houses to full fill the occupants' psychological needs.

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