WINDOWS IN THE WORKPLACE:

A COMPARISON BETWEEN WINDOW PREFERENCES AND PREFERENCES

FOR OTHER OFFICE AMENITIES AMONG WHITE COLLAR WORKERS

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ABSTRACT

The purpose of this research project was to investigate workers' preferences for windows in a white collar office environment. Other office amenities, such as larger office size and multiple levels of lighting, were also studied to determine their desirability in the opinion of office workers. Comparisons were made between the preference for windows and the preference for other amenities. A self-administered questionnaire was used as the testing instrument. The data indicates a consistent preference for windows in the office work environment. The data also suggests windows are prefered over other office amenities. Privacy is the only amenity deemed nearly as important as a window. Suggestions for future research are discussed.

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CHAPTER I

INTRODUCTION

Windows perform three primary functions; they admit natural light into a
space, they provide ventilation, and they supply a view (Caudill, Pena & Kennon,
1978). In the past, the need for ventilation and daylight made windows an essential
part of any building. As mechanical ventilation systems and artificial lights were
developed, they eliminated the need for windows by performing these vital functions
without the negative aspects of heat gain, heat loss, and sun glare often associated with
windows. In the 1960s and early 1970s, as energy conservation became an
issue and artificial ventilation and lighting systems improved, a re-evaluation of
building design was suggested (Collins, 1975; Johnson, 1986). Many people found
significant reductions in the amount of window openings or the total elimination of
windows within a building would be desirable ways to reduce energy consumption
(Collins, 1975).

While air conditioning and artificial light were designed to offer more
environmental control within a building and eliminate the need for windows,
studies indicate building occupants may not have significant increases in satisfaction
and comfort ratings in these controlled environments (Black & Milroy, 1966;
Ludlow, 1976). These natural variations which were eliminated are now considered
improvements in the built environment (Ludlow, 1976). Currently it is recognized
that with control of heat losses and solar gain in winter and the control of solar

gain and use of daylight in summer, a net benefit can be provided by windows (Johnson, 1986).

As engineers continue to debate energy issues, environmental psychologists approach windows from an entirely different perspective, the view function. People have an obvious interest in the weather and what might be happening outdoors. This information may be obtained by a quick look out a window. Window views also involve issues of worker satisfaction, productivity, psychological and biological well-being. A view outside helps to alleviate feelings of confinement and enclosure (Brill, Margulis & BOSTI, 1985; Caudill, Pena & Kennon, 1978). A window provides the opening which creates visual movement in an otherwise static space and thereby makes the space dynamic (Caudill, Pena & Kennon, 1978).

<div align="center">Justification for Study</div>

It is generally understood that office workers find windows to be a desirable amenity in an office environment. The literature indicates workers want windows in their offices (Biner, Butler & Winsted, 1991; Cuttle, 1983; Harriman, 1992; Ne'eman, 1974), people need windows in their offices for biological and physiological reasons (Benya, 1995; Collins, 1975; Gordon & Nuckolls, 1995; Kerwin, 1993; McLain & Rogers, 1981; Nichols, 1977; Ulrich, 1984) and workers compensate for the lack of windows in their office environments (Heerwagen & Orians, 1986; Sommer, 1974). In addition, studies have pinpointed preferences for particular window types (Biner, Butler & Winsted, 1991; Boubekri, Hulliv & Boyer, 1991; Butler & Biner, 1989; Nichols, 1977). While the literature finds most workers prefer windows in their workplaces, there are arguments against windows in work environments regarding productivity, privacy, and energy conservation issues (Shumake, 1992; Sundstrom, Burt & Kamp, 1980; Tognoli, 1973).

Significant literature has been written on the subject of windows in work environments, yet it is apparent that unless office design changes drastically, not all workers will be able to have windows in their workspaces. Leaman and Borden (1993) describe windows as the "classic office design problem" (p. 25). Recommendations have been made to focus issues of energy efficiency and workplace quality on the employees, yet many building owners and designers seem to ignore this point (Hequet, Picard, & Stamps, 1997). Despite the vast amount of research regarding the positive and negative effects windows have on workers and the work environment, little has been written on how building designers might otherwise compensate workers who lack windows in their workplaces. Inasmuch as not all office workers will have windows available, other desirable amenities might be made available for workers when windows are not.

<center>Purpose and Objectives of the Study</center>

Common public knowledge indicates that people believe windows are a valuable asset in any office or workspace. The primary purpose of this study was to investigate whether office workers would choose windows when given a choice between windows and other office amenities. The study was also designed to determine what amenities are considered desirable office features in the opinion of white collar workers.

<center>Research Questions</center>

The following research questions were developed:

1. Will office workers indicate a preference for windows in their offices, thus supporting the previous findings?

2. What amenities will be deemed more desirable, equally desirable, or less desirable than windows?

Limitations of the Study

The study was limited to white collar employees working in office buildings in northeast Ohio and western Pennsylvania. Employees were randomly selected from a predetermined group of companies and organizations. This was deemed necessary to guarantee a diverse group of white collar occupations. Participation in this study was voluntary. It must be assumed that each respondent answered the questions truthfully.

CHAPTER II

REVIEW OF LITERATURE

A great deal of literature has been written about windows in general. When windows are discussed, many factors come into play aside from the actual physical feature of a window in an office. Because window glass is normally transparent, at least to some degree, windows provide openings into the surrounding environment. Windows involve many psychological issues including view, privacy, daylight, sunlight, and environmental contact along with energy issues of solar gain and heat loss. The purpose of this chapter is to consolidate a review of the literature relating to windows and how they affect office workers. This chapter has been broken down into five sections: the desire for windows, the need for windows, compensation for a lack of windows, window preferences, and the negative aspects of windows.

The Desire for Windows

Windows and daylight are consistently ranked as the top two office amenities desired by white-collar employees. To the end user, the window is believed to be the single most important element of an office building (Leaman & Borden, 1993.) Daylight adds intangible value to an office by keeping workers in touch with the time of day and the changing seasons (Harriman, 1992). Heerwagen (1989) approaches windows from the view perspective, noting that contact with the outside world is often described as the most important benefit of windows. The lack of a view outside and the need for environmental information are common complaints among workers in windowless offices. Nichols (1977) found that while employees without window

views did not note dissatisfaction with their jobs more so than employees with windows, the workers without windows made more non job-related trips away from their workstations.

Cuttle (1983) conducted four surveys designed to answer two research questions: 1) Do office workers believe windows are important in their workplaces, and 2) If so, what reasons do they note for holding this opinion. The sample consisted of 471 male and female office workers from four different office buildings in England and New Zealand. The results of the survey indicate that workers deem windows as an important feature in an office and the window size should be large. Four items were noted with regard to the importance of windows. First, workers prefer to sit near the windows, even though lower status workers are often denied this opportunity. Secondly, four out of five workers believe electric light causes discomfort and prefer working by daylight. Third, many of the respondents noted that electric light in a work environment can have long-term damaging effects, yet they showed more concerned about short-term discomfort. Finally, workers do not believe that poorer work output is a result of electric light, but rather that greater personal stress is necessary to produce the work. Cuttle also found that workers who sit far away from windows would like to sit closer and those who currently sit close to windows do not want to change.

In another study exploring people's beliefs about effects of lighting, Veitch and Gifford (1996) also found their respondents attributing discomforts such as eye strain and headaches to artificial light. The respondents held a strong opinion about daylight and its beneficial effects. The results indicated a preference for daylight over artificial light.

Sunlight penetration in a workspace has been found to have a significant direct

effect on job satisfaction and general well being (Leather, Pyrgas, Beale, & Lawrence, 1998). Ne'eman (1974) conducted two surveys regarding attitude toward sunshine. For the purpose of his research, Ne'eman defines sunshine as "the overall spectrum of direct solar radiation reaching the Earth" (p. 159). In the first study, 647 interviewees in four types of buildings, houses, schools, offices, and hospitals, answered basic questions regarding sunshine which might apply to any building along with questions which pertained exclusively to their particular building type. The results indicate housing respondents had the highest preference for indoor sunshine with 93% of respondents noting they liked the effects of sunshine in their homes. In offices, 73% of respondents considered the sunlight a pleasure. Ninety-one percent of hospital patients found indoor sunshine to be pleasurable while only 31% of the hospital staff agreed with their opinion. School respondents also held a negative opinion about the effects of indoor sunlight with 52% finding it to be a nuisance.

Ne'eman's second study was designed to determine preferences between the sun actually shining into the interior of the building and a good view out a window but no interior sunshine in these same four environments. In all four cases, subjects chose the pleasant view over the indoor sunshine. Fifty-five percent of the school respondents preferred the good view, 18% preferred the sunshine, and 27% did not have a preference. In offices, 61% chose the view, 36% picked sunshine, while 3% did not note a preference. The housing respondents recorded a 58% preference for the view with 14% not showing a preference while the hospital patients showed the lowest preference for the view at only 50% with 19% undecided. Ne'eman cautions that the research was conducted in England, where the amount of sunshine is limited as compared with many other regions, and the findings may not be characteristic of other locations. Ne'eman hypothesizes that in an unpredictable climate like England, people

may chose the view, knowing that unlike the sunshine, the pleasant view will always be there.

The desire for windows might also involve the desire for status. In traditional office layouts, the corner office with windows on two walls was deemed the most prestigious. Wooden furniture, a larger office, and better views are all associated with higher rank (Becker & Steele, 1995a). Krohe (1995) notes that access to daylight and outdoor views have long been classified as executive perks. Windows, and the privacy to gaze out of them at will, are considered the most desirable features of the coveted corner office. Henderson (1998) describes corner offices and private window walls as "the most desirable real estate in almost every office" (p. 11).

While some may argue the office as a statement of status is an idea from the past, many traditional companies maintain the image of the executive suites ("The View,"1996; Verespi, 1996). As one moves higher up the staff hierarchy, employee needs concentrate on issues of quality. Interior design, room size, and office view begin to take precedence over issues of technology, servicing, and task equipment (Leaman & Borden, 1993). With the increased use of cubicles and open office plans, access to windows for the majority of workers may only be found in common areas and meeting rooms (Coy, 1997; Filipczak, Gordon, & Stamps, 1997).

Henderson (1998) believes that eliminating private offices along the window walls and thus enabling daylight to reach shared and open-plan spaces would be an impressive move towards creating a non-hierarchical office environment. Becker and Steele (1995b) conclude that treating windows as a reward for status within the company contradicts employee empowerment policies and degrades the spirit of the organization. They find that by placing common areas such as meeting rooms, cafeterias, lounges, and walkways along window walls, more employees will have

access to pleasant views. Overall moral is enhanced when a firm clearly defines areas of natural light and views outside as spaces set aside for the benefit and enjoyment of all employees.

<div align="center">The Need for Windows</div>

When the need for windows is discussed, it is more than a strong desire from the building's occupants to be able to see outside. Leather et al (1998) believe the desire for windows is not a simple preference but a fundamental need which effects the psychological and emotional well-being of the worker. The proposed relationship between psychological health and exposure to nature is a very old idea which has appeared across many cultures (Ulrich, 1979). Recently, researchers have begun to identify the negative effects that daylight deprivation has on various psychobiological functions (Terman, Fairhurst, Perlman, Levitt, & McCluney, 1989). In addition, a variety of researchers have pinpointed psychological, biological, and physiological needs which are met through contact with the natural environment. Issues of concentration, productivity, and patience are also discussed as a part of this need for windows.

The results of a 1,200 person survey by Kaplan find that workers with window views are more likely to exhibit less frustration, more enthusiasm, better concentration, increased patience, and have fewer illnesses than their co-workers in windowless environments. Kaplan also finds that workers with urban views, that is views with very few trees overlooking parking lots or other buildings, still note more job satisfaction than workers without a view (Light & Tilsner, 1993). Leather et al (1998) found a window view of natural elements reduced the negative impact of job stress on the intention to quit. Stone (1998) found the presence of a window to be motivating for persons engaged in computational tasks. A windowed office is also

deemed more helpful than a windowless room when the occupant must accomplish a creative task (Stone & Irving, 1994).

Extensive research has been compiled regarding the need for windows in a hospital environment. Ulrich (1984) studied postoperative patients at a suburban Pennsylvania hospital over a nine year period to investigate recovery rates based on patients' view from their hospital rooms. Two conditions existed, patients on one side of the wing had a window view overlooking a grove of deciduous trees, while patients on the other side had a view of a brown brick wall. Patients were randomly assigned to the rooms as they became available, all patients studied were hospitalized for the same surgical procedure, and patients who developed serious complications or had a history of psychological problems were excluded. The results indicated patients with a tree view spent approximately one less day in the hospital than patients with the wall view. More negative comments were recorded on the charts of wall view patients, 3.96 per subject, as compared to 1.13 for the patients with a view of trees. Wall view patients received higher doses of moderate to strong pain killers while the tree view group received more medication such as acetaminophen and aspirin. The rate for minor postsurgical complications was also slightly lower among patients in the tree group.

Wilson (1972) sought to examine the effect windows in an intensive care unit might have on patients by providing them with a view and a sense of orientation by studying the occurrence of postoperative delirium among 100 surgical patients. Delirium may develop as a result of sensory deprivation and extended periods of sleep at a time when a person's ability to handle stress has already been reduced by illness or the effects of the surgical procedure. Two nearly identical hospitals in the same community were utilized in this study. The major difference was the presence of

windows in the intensive care unit of one hospital, while the second intensive care unit was without windows or skylights. Patients were all recovering from major surgeries which required general anesthesia and a minimum stay of 72 hours in intensive care. Wilson found 40% of the patients in the windowless unit suffered from postoperative delirium, as compared to 18% in the unit with windows. In addition, three of the patients without windows had depressive reactions, while only one patient from the windowed space was affected. These results are consistent with the premise that postoperative delirium may be due in part to sensory deprivation. Based on this study, windows are highly desirable assets in the intensive care unit in the effort to prevent sensory deprivation and the occurrence of postoperative delirium.

An earlier study by Ulrich (1979) involved a view of nature and psychological health comparison between two groups of slightly stressed individuals. One group was shown slides of simple nature scenes comprised mostly of green vegetation while a second group viewed slides of urban landscapes without any natural elements. Comparisons were made between the two groups regarding feelings of sadness, fear arousal, anger and aggression, positive affect, and attentiveness. The findings indicate the stressed respondents felt significantly better after viewing the nature scenes, as positive affect was increased and fear arousal was decreased. The group which observed the urban scenes had a significant increase in sadness. There was also a non-significant, yet consistent tendency for the nature scenes to reduce feelings of anger and aggression while the urban scenes seemed to aggravate such feelings. The results suggest a person's psychological well-being can be influenced by the outdoor visual environment. Ulrich believes design and planning decisions should be made with these ideas in mind. Considerable importance should be placed on providing visual window contact with nature, particularly in hospitals and other high

stress environments.

Bordass (1993) finds windows add outside awareness and natural light which help people orientate themselves. Pennebaker and Lightner (1980) note a lack of external stimulation gives workers more opportunity to contemplate internal sensations. Repetitious and boring work environments have been found to positively correlate with the number of health center visits.

In addition to visual attributes, an operable window also affords the building occupants an opportunity for fresh air. Bordass (1993) finds that regardless of outside air quality, natural ventilation is psychologically more acceptable than any type of mechanical system. Psychologists find some degree of user control of the building, such as opening a window, is significant to perceived well-being. Before-and-after studies indicate productivity gains when individuals have more control of their immediate surroundings (Becker & Steele, 1995b). While McLain and Rogers (1981) agree that fresh air, light, and emergency egress are important issues in the need for windows, they believe people are most interested in windows because they provide the necessary contact with the outside world.

Rather than discussing the aesthetics of a nice view, Heerwagen (1989) studied the effects a nice view might have on people's psychological and physiological processes. Heerwagen believes people's desire to view nature is a reflection of man's evolutionary heritage, connected to our primitive emotional centers. Noting the relatively short length of time humans have been living in permanent dwellings as compared to the million years or more that man lived with nature, she concludes that human functioning may still be deeply rooted in the patterns and rhythms of nature. We are just beginning to understand the relationship between human well-being and nature in which window view may play a vital role. Gifford (1997) believes that in

industrialized nations, the biological rhythms of most people have been changed by invention of artificial light.

Terman et al. (1989) note the circadian physiological rhythms which control body temperature, hormone levels, and daily cycles of activity and rest are particularly vulnerable to a lack of daylight. This physiological timing system loses optimum synchrony when an adequate day-night cycle is unavailable, ultimately disrupting mood, health, and performance ability. Terman et al. believe the protected indoor working environment creates an instability which poses potential hazards to human health. Research indicates that long term deprivation from sunlight makes people depressed and less capable of functioning (Becker & Steele, 1995b). In Great Britain, sunlight-deprivation syndrome is now considered a recognized form of employee depression (Welch, 1996). In Germany and Scandinavia, working near a window in now considered an employee right (Bordass, 1993). This right has had a tremendous influence on office design trends in these countries. Some European countries even have laws mandating natural daylight in the personal work areas of all employees (Becker & Steele, 1995b).

The human mind and body are designed to operate most efficiently under high sun (Krohe, 1995). Scientific research has also found light to be critical to human health in that light entering the eye helps control the human endocrine system, particularly the suppression and secretion of melatonin (Benya, 1995). Relatively high levels of illumination suppress melatonin secretion, which corresponds with an alert state of consciousness, as high levels of melatonin cause drowsiness. Glances out a window and the sunlight shining through the window can provide the illumination necessary to adequately suppress melatonin levels. This may explain why people who work in windowed office spaces appear to be more productive and happier than

workers who do not have access to windows. Benya believes designers need to increase the amount of fenestration and thus the amount of daylight into building interiors to promote better health and an increased sense of well-being among office workers. Boubekri, Hulliv, and Boyer (1991) find the positive aspects of sunlight include improving the psychological and emotional well-being of building occupants.

Gordon and Nuckolls (1995) find that changes in stimuli are necessary for people to remain alert and sensitive and to satisfy the mind and body's biological need for change. A view to the outside gives workers the opportunity to gaze out the window, focusing on distant objects, and in turn providing relief for eye muscles. Biological cycles are kept in tune by information received from the sky regarding the weather and time of day. Small openings can satisfy the basic need to see outside, but larger windows are often more desirable. Satisfaction is increased with a more complex view. The ever changing nature of daylight provides a variance in light which also helps to reduce monotony and makes the building more interesting (Bordass, 1993; Gordon & Nuckolls, 1995).

Compensation for a Lack of Windows

Heerwagen and Orians (1986) investigated the use of visual decoration in windowed and windowless office. Using content analysis, researchers surveyed 75 offices with and without windows on the University of Washington campus, focusing on visual office decor such as posters, photographs, and paintings. The results indicate significantly more visual materials were found in the offices without windows. Only two windowless offices were devoid of any visual materials, while 12 offices with windows were without visual decoration. The analysis of the visual materials showed landscapes were found nearly four times more often in windowless

offices than they were in offices with windows, yet the number of cityscapes was very similar between the two office environments. The study also found that more than 75% of the visual materials found in windowless offices had no buildings or other man-made structures shown in them, while the same was true for only 58% of the offices with windows.

Heerwagen and Orians (1986) believe these findings indicate office workers use visual materials as a surrogate view when windows are not available. The predominance of natural subject matters is evidence that people feel a strong need to have contact with nature, even when an actual view of the natural outdoors is unavailable. Their study suggests the psychological comfort of building occupants may be dependent on visual contact with nature.

Biner, Butler, Lovegrove, and Burns (1993) discuss a series of four experiments which where designed to further explore the hypothesis that people who work in windowless environments compensate for the windows they lack through office adornments. The first two studies examine potential window substitutes, while the third and fourth studies explore the use of the window substitutes in the actual office and the compensation factors involved. Experiments 1 and 2 found agreement on the following four categories of items which could be identified as potential window substitutes; other apertures, paintings and art, living things, and panels. The third study was designed to be similar to the 1986 experiment by Heerwagen and Orians, as 173 office spaces were evaluated for: 1) the number and size of objects from the four relevant window substitution categories noted in Experiments 1 and 2; 2) the number and size of exterior windows; and 3) the amount of available wall space. The results indicate no significant difference between the number and size of pictures or living things in offices with and without windows, therefore the data do not

support the window compensation hypothesis. In the fourth experiment, the researchers found that while workers often use pictures of nature, pictures of people, and living things to adorn their offices, they do not knowingly do so to compensate for a lack of windows in their work environment. They do note however, that while these workers do not alter their environments to compensate for the lack of windows, this does not eliminate the possibility that they may alter their behavior as a form of compensation. Examples of this behavioral compensation might be eating lunch outdoors or in a windowed space, making unnecessary trips so they may pass by a window, or requesting transfer to a work space with a window.

While working on a design project, Sommer (1974) interviewed employees of the underground, windowless office spaces within the building. Most interviewees expressed strong feelings of discontent with their windowless work environment and used words such as depressing, irritating, confining, isolating, and not stimulating to describe their offices. Major employee complaints concerned the stale air and poor ventilation, the lack of stimulation and change, and the lack of information about the weather. Many employees reported making trips upstairs whenever possible just for the opportunity to look outside and numerous employees noted spending their lunches outdoors regardless of the weather. Sommer found that employees in this setting rarely closed their office doors. He also noted the frequency in which employees hung pictures and posters of seascapes, landscapes, wild animals, and vacation spots on their walls and believes the posters serve as surrogate windows to employees who otherwise have no view.

Window Preferences

In addition to studying the desire or need for windows, more specific research has examined preferences for particular window types. A study by Nichols (1977) was designed to more explicitly examine the behavioral responses and attitudes of individual workers employed in an urban high-rise office to the window provisions of their work environments. Three variables concerning the view to the outside were studied. Data were collected by means of a questionnaire filled out by sixty volunteers representing a cross-section of the employees of a single organization. Respondents were given a list of window attributes to choose from and also shown pairs of drawings representing various window attributes. After answering the questionnaire, the volunteers were asked to complete a three day time and space mobility log. Another set of window drawings were then given to the volunteers and various questions were asked. The findings indicate that 76% of the respondents selected the view closest to the ground floor as the least visually separating from the exterior environment. Windows at eye level and those which offered the largest single view made workstations feel less enclosed. One large window was preferred over two smaller windows regardless of how the two windows were located within the workspace and what the view was from these windows. Opaque windows, skylights, and slits of natural light did not alleviate feelings of enclosure. Gifford (1997) also finds that feelings of being crowded can be affected by the physical positioning of windows within a space.

Butler and Biner (1989) created a study to further the understanding of window preferences. Their review of the previous literature indicated that large windows are typically preferred over smaller windows. Contrary to the previous research, Butler and Biner proposed that window size preferences vary with the function of the space,

this being the first hypothesis of the study. The second hypothesis proposed that in some spaces, there will be a preference for small windows or no windows at all. The third objective involved developing a systematic theory of predicting window size preferences. This theory would involve not only predictive size preferences, but also the reasons behind these preferences.

Data were collected by means of a questionnaire distributed to 59 undergraduate students at Ball State University. Participants were asked about 14 different spaces and answered questions in two categories; 1) Type of Windows, and 2) Factors Influencing Your Preferences. Under window types, subjects were asked to indicate the best window option for a particular space and to further indicate all window options deemed unacceptable in that same space. Participants were then asked which factors were involved in their preference judgments. In reference to the first hypothesis, the findings of this study indicated that window preferences do vary depending on the setting. With this outcome, the researchers cautioned others from generalizing window preference results across settings. The second hypothesis was also supported. In the 14 spaces selected for study, a preference was found for small, medium, or no windows, rather than large windows in a majority of cases. With regard to the third objective, a stepwise regression analysis found the view to the outside for time of day information was the strongest predictor of size preference, with ventilation being the second most important prediction factor. Other significant variables included view of weather, view of people, appearance, mood, plants, privacy, sunlight, status, interaction with people, and temperature. The reasons listed for determining the window size preference varied widely depending upon the space and were highly predictive of the size judgments. Butler and Biner note that to the best of their knowledge, this study represents "the first systematic cross-setting

investigation of factors underlying window preferences" (p. 28).

Biner, Butler, and Winsted (1991) explored a different type of window, the inside window. Inside windows are defined as windows which have a view into another interior space rather than to the outside or exterior of the building. The preference for inside windows may be very different from that of an outside window. Conventional windows provide a view to the outside, of daylight, and of people passing by while indoor windows can only do so indirectly. Inside windows have different interpersonal consequences because they provide a view of other people who work or interact within the same space and they allow for visual communication, thus different privacy issues are involved.

Two separate studies were conducted by Butler, Biner, and Winsted (1991) regarding inside windows. The first study utilized a sample of 35 full-time female secretaries and a group of 205 undergraduate students which were surveyed by a questionnaire. The results indicate that overall, subjects recorded a decided preference for inside windows. Secondly, a comparison between the two subject groups found similar window preferences in the library and office settings only. As a whole, the students expressed stronger preferences for inside windows than the secretarial subject group. Analysis of a third objective found the desirability of inside windows varied among different situations and the different subject groups. Finally, it was proposed that the situational differences in window preference may be due in part to people's interest in viewing others.

The second study addressed two issues: 1) the importance of an inside window providing visual access to a conventional outside window, and 2) the effects of other mediating factors; interpersonal privacy, work task, and job-related status, on the preference for inside windows. Data were collected from 36 undergraduate students

using a 1/12 scale model which could be manipulated by and at the direction of the individual subject. The results indicate that in general, a window accessing an adjoining office was preferred. Windows which gave visual access to an outside window were preferred over windows which looked into adjoining offices without windows. Further, significantly larger inside windows were preferred by subjects when the adjoining office had an outside window. The three mediating factors, privacy, primary work task, and job status, were found to have no effect on general desirability or size preference of inside windows with one exception; the subordinate/visual-nonvisual task order condition. The researchers found this interaction unanticipated and difficult to explain. By analyzing the results of similar studies utilizing the same apparatus, the authors find the preferred size for inside windows to be slightly smaller than the preferred size of outdoor windows.

Boubekri, Hulliv, and Boyer (1991) discuss the positive and negative aspects of sunlight in an indoor space as it relates to window preference.   A study was proposed to determine the size of sunlight penetration areas preferred by office workers, as most previous studies measured sunlight preferences by duration of light penetration only. The specific areas of interest were how different amounts of sunlight penetration affected the degree of satisfaction and the mood of the office worker. The variables of window size and the amount of sunlight penetration were manipulated through the use of blinds and curtains and the position of the respondent's desk was changed in relation to the window. The sample was comprised of 38 female and 2 male office workers who were given 45 seconds to proofread a page of text under varying conditions in an actual office setting. After proofreading the text, the respondents answered a questionnaire designed to assess their current mood and level of satisfaction.

The results indicate that neither a change in the amount of sunlight nor the size of the window affect the observers' degree of satisfaction or their feelings of excitement or relaxation when they are facing the window. When seated sideways to the window, the size of the window does not significantly affect the observer's feelings of relaxation, excitement, or satisfaction. From this same seated position however, the amount of sunlight penetration is shown to significantly impact the observer's feelings of relaxation while the degree of satisfaction and excitement remain unaffected. Feelings of relaxation are promoted in a high pleasure, low arousal environment. Relaxation reached the highest level when the sunlight penetration was at 20%, and began to decrease rapidly once the amount of sunlight was greater than 40%. The researchers believe that sunlight penetration in modern amounts, 15% to 25%, are most ideal for creating the relaxing environment which is necessary to perform tasks requiring high levels of concentration. A study by Stone (1998) further supports these findings by noting an increase in relaxation and motivation for subjects involved with a computational task in a room where sunlight penetration was behind and to the side of the respondents.

<div align="center">The Negative Aspects of Windows</div>

Even-Or (1989) finds the performance requirements of a window to be full of contradiction. Workers want a view outside, yet they want privacy from others looking inside. The heat from solar radiation is often desirable, while the glare from solar radiation is objectionable. Even-Or believes window systems must be re-designed for better response to ever-changing conditions.

Daylight is constantly changing. While the varying light helps to reduce monotony, daylighting within an office environment must be carefully controlled. Excessive changes in light contrast or glare lead to visual fatigue and stress

for the building's occupants. Because of differences in criteria, different types of building openings may need to be used for daylighting and for view (Gordon & Nuckolls, 1995) .

Boubekri, Hulliv, and Boyer (1991) find problems with glare and overheating can create a sense of general dissatisfaction among building occupants. These occur most often when sunlight shines directly into work areas, but when properly controlled, sunlight can provide a positive source of heat and light for the building.

Sundstrom, Burt, and Kamp (1980) discuss three interrelated studies which examine the correlation between psychological privacy, architectural privacy, job performance, and job satisfaction. For the purpose of the study, architectural privacy is defined as the acoustic and visual privacy which an environment provides to the occupant. The sample groups consisted of 85 upper level State administrators whose jobs involved demanding complex work, 30 clerical employees who worked in an open office environment of a hospital, and 98 nonacademic employees with either complex and clerical jobs at the University of Tennessee. For each study, the participants answered a questionnaire. The researchers visited each individual's work space to take measurements and note particular features, such as distance to corridors, distance to closest co-worker, and visibility into other workspaces.

The results of all three studies found a positive association between psychological privacy and architectural privacy. Employees who considered their workspaces private reported less distractions, noise, and crowding than those employees who believed they lacked privacy. Researchers did not however find a relationship between architectural privacy and social interaction, which proved inconsistent with earlier research studies. Subjects preferred quiet, enclosed private work areas which were visually inaccessible, regardless of their job type. In relation

to privacy and job performance, the results indicated a limited positive correlation, even among people with the simplest job tasks. This contradicts the prediction and suggests that even clerical work can be interrupted by distractions and noise. With regard to windows specifically, a negative correlation was noted between the employee's job performance rating by a supervisor and a window being located within 10 feet of the employee's workstation. While the study does not make specific mention of the window type, it appears the windows being discussed are interior windows which would allow co-workers and supervisors to have visual access to one another.

According to Shumake (1992), white collar productivity problems center around the Beta Sector deterrents, the deterrents that are a result of the interior environment or physical surroundings of the worker. Shumake notes various items which may help reduce worker fatigue including workstation design and proper lighting, while focusing on sensory distraction, which he believes causes the major portion of interference and inadvertent disruption. Sight is the sense most likely to cause a distraction, yet also the easiest to control. Sights in the workplace can become distractions under two conditions: 1) the worker can see what is happening, and 2) the occurrence is interesting enough to disturb a person's consciousness. Sensory distractions are usually perceived as a distraction to the worker only when the experience is unpleasant. If the occurrence is enjoyable, it is likely only supervisors and managers will perceive the experience as a distraction.

Internal sight distractions may be caused by a coworker visiting or passing by the worker's desk. External sight distractions usually involve looking through an exterior window to the outside or through an interior glass panel which opens into an atrium or other interior area. Shumake believes the window or glass partition is a

potential productivity deterrent if it is not properly treated or eliminated. Each worker in an office or a workstation with a window or glass partition may have his productivity reduced significantly by the sight distraction it causes. Shumake notes "It is important that individual workers be shielded from inadvertent distraction made possible by their being able to observe activities and occurrences with which they have no concern except human curiosity" (p.27). He finds the best solutions to be private offices with doors that remained closed, offices without windows or with windows and closed blinds. In addition to sight distractions, he also discusses the expense involved with glass walls and visual control treatments.

Tognoli's (1973) experiment was an attempt to discover how different types of environments affect a subject's attitude and retention, particularly in a laboratory setting. In this research, three environmental conditions were studied, the absence or presence of windows, the amount of embellishment in the room, and the respondent's chair type. The sample consisted of 56 male and female college undergraduates. Respondents viewed a short videotape under one of eight experimental conditions and were then given a brief retention questionnaire concerning contents of the video and a questionnaire regarding their feelings about the room.

The results indicate subjects had the best retention level when the video was viewed in an unembellished, windowed room with a soft chair, yet the next three highest retention scores where achieved in rooms without windows. A two-way interaction between the chair type and the window condition found the best retention scenarios to be the hard chair-windowless room and the soft chair-window room. The subjects' attitudes towards rooms with the varying window, embellishment, and chair conditions were divided into four attributes; interestingness, pleasantness, comfortableness, and distractingness. Rooms were deemed more comfortable and

pleasant when a window was present. The attribute of interestingness was unaffected by the window's presence or absence. No significant difference in the level of distraction was found with any of the experimental room conditions. Based on these findings, it appears retention may improve in rooms without windows, while the level of distraction remains unaffected.

Discussing the conflict between computers and windows, Bordass (1993) notes that daylighting in offices has been neglected in recent years because of the computer related issues of glare and screen visibility. Bordass believes new technology will produce display screens which will be legible under all types of lighting conditions. He finds the workers' needs should not sacrificed because of failures in equipment design. Gifford (1997) comments that many of the problems of glare came about because older offices were not originally designed to accommodate video display terminals. Likewise, VDTs were at first very susceptible to glare, whereas newer models are equipped with coated screens and swivel mechanisms to minimize these problems. Noting that daylighting creates worthwhile savings in electricity, Bordass also believes the improved and more widespread use of the many existing types of automatic, manual, and fixed forms of shading systems would improve control over glare and solar heat gain to maximize the benefits of windows. Galitz (1984) suggests the use of outdoor window overhangs to help reduce the amount of bright light and glare.

In response to all the negative comments concerning windows, Ludlow (1976) believes window design should involve a more comprehensive approach considering all the various window functions. Reducing the size of the fenestration is not necessarily the best solution to problems such as glare, heat gain and loss, privacy and noise issues which are associated with windows. The building facade should be

studied for lighting, thermal, and acoustic requirements along with the visual function of the windows. Each proposed window location is unique in terms of light, thermal and acoustical qualities, and view, therefore generalizations cannot be made. Architects often use photomontage to illustrate how a new building will appear in a proposed setting from various angles. It is the opinion of Markus (1967) and Ludlow (1976) that a similar technique be used to study the proposed window views from different sides and floors of a building before the building is designed. The shape, orientation, and fenestration in all new buildings should be carefully considered in order to minimize the negative effects and capitalize on the positive effects of windows.

Air conditioning and artificial light were designed to offer more environmental control within a building and eliminate the need for windows, yet studies indicate building occupants may not have significant increases in satisfaction and comfort ratings in these controlled environments (Black & Milroy, 1966; Ludlow, 1976). These natural variations which were eliminated are now considered improvements in the built environment. In office buildings, the value of a view has been established and further clarified that any view is better than no view. Ludlow believes these findings provide additional reasons for including windows in new buildings, rather than designing windowless environments. In the end, it is the building user who will make the final decision regarding the success or failure of the building (Humphreys & Nicol, 1970; Aldworth & Bridgers, 1971; Ludlow, 1976).

<p align="center">Summary</p>

This chapter looked at five different window related issues: the desire for windows, the need for windows, compensation for a lack of windows, window preferences, and the negative aspects of windows. Based on the literature, office

workers found windows to be a desirable feature of a workspace. While the existing research was extensive, much of it targeted a specific group of respondents, often people all working within the same building or people answering questions about the same environment.

Research Question 1 was developed to further substantiate the existing research indicating a preference for windowed work environments. The researcher also hoped to target a more generalized white collar population to see if the preference for windows would remain constant across a broader range of offices types.

The review of literature found significant information on many window related issues, yet very little material was found on how workers might be otherwise compensated when windows are not available. Information regarding emerging European design trends indicated movement towards mandatory natural light and window views within all office workspaces. Unless North American countries begin to incorporate windows in all workspaces, some workers will continue to have windowless work environments. Research Question 2 was formulated as an attempt to determine what office amenities would be viewed as less desirable, equally desirable, or more desirable than windows.

CHAPTER III

METHODOLOGY

Sample

The sample consisted of 167 white collar office workers employed in northeastern Ohio and western Pennsylvania. Participants worked in a variety of geographical settings. Some respondents were employed in major cities such as Cleveland and Pittsburgh, while others worked in mid-sized cities such as Akron or Canton, Ohio. In addition to urban areas, participants were also employed in a variety of suburbs, small towns, and rural areas.

A convenience sample was obtained from a pre-selected group of companies. The actual respondents were selected at random by acquaintances of the researcher. All participants were employed in white collar occupations rather than blue collar or other service related occupations. Sixty-three of the respondents were male and 104 female. The age of the population ranged from 20 to over 70 years of age, with the majority of the participants, 45.6%, between 30 and 49 years of age (see Table 1). This roughly approximates the population of office workers in general.

Of the respondents, 31.1% had been employed in their current profession for five years or less, with 23.4% being employed in the profession for more than 20 years. The median number of years of employment in the current profession was 11 - 15 years. The education level of the respondents was diverse. The majority of the respondents, 35.9%, had earned a bachelor's degree, while 15.6% had a high school education. Only one of the participants held a doctoral degree.

Table 1

Gender, Age, Years Employed in Current Profession, and Education

	Frequency	Percent
Gender:		
Males	63	37.7
Females	104	62.3
Age:		
Less than 20	0	0.0
20 - 29	24	14.4
30-39	46	27.5
40-49	47	28.1
50-59	32	19.2
60-69	16	9.6
70+	1	0.6
Did Not Respond	1	0.6
Years in Current Profession:		
Less than 1 Year	3	1.8
1-5 Years	49	29.3
6-10 Years	28	16.8
11-15 Years	29	17.4
16-20 Years	18	10.8
More than 20 Years	39	23.4
Did Not Respond	1	0.6
Education:		
High School	26	15.6
Some College	38	22.8
Associate Degree	18	10.8
Bachelor's Degree	60	35.9
Master's Degree	24	14.4
Doctoral Degree	1	0.6

n = 167

At the time of the interview, most participants worked in a private space with 32.3% having a private office and 19.8% working in a private cubicle (see Table 2). Of the respondents, 48.8% noted their job classification as professional, with 27.7% noting it as clerical. Ninety-one percent of the participants were employed in a full-time position. A computer was on the desk of 83.8% of the respondents and the

median computer use time was three to five hours per day. There was a window in the current workspace of 66.5% of the participants.

Data Collection

Data were collected by means of a self-administered questionnaire which was approved by The University of Akron's Institutional Review Board for the Protection of Human Subjects (see Appendix 1). The questionnaire was developed based upon the review of literature, the researcher's knowledge of office design, and feedback from design professionals. The sample was one of convenience. Participants were chosen at random from a group of pre-determined offices. Companies were originally selected to guarantee a diverse group of white collar occupations. The researcher was acquainted with at least one person working at each of the initially selected offices. Each acquaintance was asked to randomly distribute the questionnaires to co-workers. In some cases, the acquaintance collected questionnaires from several different offices. The attempt to achieve diversity appears successful. Of the participants, 37.1% were employed at offices with 16 - 49 workers, 32.3% were employed at small offices with 1 - 5 people, and 1.8% were employed at very large offices with 500 or more employees. See Table 3 for the diversity of the office sample.

The questionnaire was divided into three sections. Part 1 asked participants to rank preferences for 25 different office environments based on a 5-point Likert scale. Part 2 of the questionnaire asked respondents to choose between two similar windowed and windowless offices under six different conditions. Part 3 contained questions designed to obtain the demographics of the sample. A copy of the questionnaire can be found in Appendix 2. Each respondent also received a separate letter explaining the reasons for the study, voluntary participation, and confidentiality of their responses (See Appendix 3).

Table 2

Current Work Environments and Employment Related Statistics

	Frequency	Percent
Current Work Environment:		
Private Office	54	32.3
Shared Office	23	13.8
Private Cubicle	33	19.8
Shared Cubicle	3	1.8
Open Office	31	18.6
Other	22	13.2
Did not respond	1	0.6
Job Classification:		
Clerical	46	27.5
Technical	8	4.8
Professional	81	48.5
Managerial	28	16.8
Medical	1	0.6
Responded "Other"	2	1.2
Did not respond	1	0.6
Type of Employment:		
Full-time	152	91.0
Part-time	14	8.4
Did not respond	1	0.6
Computer On Desk:		
Yes	140	83.8
No	27	16.2
Typical Daily Work-Related Computer Use:		
Less than 1 Hour	33	19.8
1-2 Hours	23	13.8
3-5 Hours	62	37.1
6-8 Hours	39	23.4
8+ Hours	9	5.4
Did not respond	1	0.6
Window in the Current Workspace:		
Yes	111	66.5
No	56	33.5

Table 3

Number of People Employed in Office

	Frequency	Percent
1-5 People	54	32.3
6-15 People	34	20.4
16-49 People	62	37.1
50-99 People	8	4.8
100-249 People	2	1.2
250-499 People	1	0.6
500+ People	3	1.8
Did not respond	3	1.8

n = 167

Assumptions of the Study

It must be assumed that each respondent answered the questions truthfully. Because the researcher was not available for comment while the surveys were being administered, it must be presumed that the respondents understood the questions.

Research Questions

The following two research questions were derived from the literature review.

1.   Will office workers indicate a preference for windows in their offices, thus supporting the previous findings?

2.   What amenities will be deemed more desirable, equally desirable, or less desirable than windows?

Measurement

Scales are common units of measurement employed when the researcher wants to evaluate how a person thinks or feels about an issue (Neuman, 1994). A Likert scale was used in Part 1 of the questionnaire. Likert scales are easily understood and commonly used in survey research. Developed by Rensis Likert in the 1930s, these scales measure attitudes through the use of numbers (Neuman, 1994). Neuman

cautions that while Likert scales produce an ordinal measurement, there is no measurable interval between the response categories.

Part 1 of the Questionnaire

In Part 1 of the survey instrument, a five-point Likert scale was used to measure preferences for 25 different office scenarios. The scale was constructed as follows: 1-would like very much, 2-would like somewhat, 3-neither like nor dislike, 4-would dislike somewhat, 5-would dislike very much.

Each of the 25 listings in Part 1 described a different office environment. Some scenarios described the physical attributes of the office such as an average size office (10' x 12') with a window or a 12' x 12' office with vinyl tile flooring, painted walls, and a window. Other scenarios discussed the location of the office without giving specifics about the actual physical space, i.e. an office close to the copy machine or an office located near the front entry of the building. A portion of the scenario descriptions gave detailed information such as an office with carpet, painted walls, and a window, where occupants are not permitted to display any type of visual decoration on the walls, but photographs are allowed on the desks. Other descriptions were very vague, i.e. an office with a large number of plants. Scenarios such as a large office (12' x 16') without a window made specific mention to the lack of a window within the office space. Other descriptions such as an office in the basement of the building allowed respondents to make assumptions about the potential presence or lack of a window.

Research Question 1 is directly addressed in Part 1 of the questionnaire. Eight of the office scenarios made specific mention to a windowed or windowless environment. Three scenarios made inferential mention to the lack of a window. The results will indicate whether participants preferred the windowed office scenarios

rather than the windowless ones. If the respondents deem the windowed offices to be desirable environments, they will assign a scale rating of one or two. Likewise, if the respondents find the windowless environments to be undesirable, those scenarios will be given a rating of four or five. A neutral rating of three should be assigned when respondents do not have strong positive or negative opinions about a particular scenario.

Part 1 of the questionnaire indirectly addresses Research Question 2. While participants were able to rank the desirability of each office scenario, thus indicating what amenities they found to be desirable or undesirable, they were not directly comparing the amenities mentioned to a windowed or windowless environment.

Part 2 of the Questionnaire

Direct comparisons were made in Part 2 of the questionnaire. Participants were given a choice between a windowed or the windowless office under six different conditions. In the six scenarios, respondents were asked to select Office A, with a window, or Office B, without a window. In each case, Office A offered a window while Office B offered a higher degree of flexibility with one of six amenity variables; size, level of finish, lighting, location, surrogate views/personalization, and privacy.

Research Question 2 is directly addressed by Part 2 of the questionnaire. In Part 2, respondents were asked to make a choice between having a particular amenity in their office or having a window. The results will indicate what amenities are considered more desirable, less desirable, or equally as desirable as a window. Research Question 1 is also directly addressed here. If the participants choose the windowed offices rather than the windowless offices with other amenities, they will be supporting the previous findings.

Demographic Variables

Part 3 of the questionnaire was designed to collect the demographics of the sample. Respondents were asked to indicate their gender. Data regarding age, number of years employed in current profession, education, job classification, current work environment, number of hours per day spent working on a computer, and number of people who work in the office were measured in categories. Information about the presence of a computer on the respondent's desk, full or part-time employment, and the presence of a window in the current workspace was surveyed with yes or no answers.

Statistical Analysis

For Research Question 1 and Research Question 2, comparisons of means and standard deviations were used to answer research questions. Because these are research questions and not hypotheses, inferential statistics or other statistics for hypothesis testing are not appropriate. Comparisons may have statistical significance but they have not been statistically tested. Correlation coefficients were calculated for additional findings.

CHAPTER IV

FINDINGS

Research Question 1

The first research question asked: Will office workers indicate a preference for windows in their offices, thus supporting the previous findings? The data collected did support the previous findings. A preference for windows in the workplace was indicated in data gathered from Parts 1 and 2 of the questionnaire.

Part 1 of the questionnaire, where participants were asked to rank preferences for 25 different office environments based on a 5-point Likert scale, supported the findings (see Table 4). Ratings of one, "would like very much", and two, "would like somewhat", were given to three of the five scenarios making specific mention to a window in the office. Of the two remaining windowed scenarios, one received an equal number of twos "would like somewhat" and threes "neither like nor dislike", while the other scenario received the neutral rating of three.

Ratings of four, "would dislike somewhat", and five, "would dislike very much", were given to all six office scenarios which were described as having no window, no natural light, being located in a basement, or being located in an interior space. Of the 25 scenarios listed, only 2 received a rating of five, describing an office which the respondent "would dislike very much". One of these spaces was described as a large office (12' x 16') without a window. The other office was described as an office in the basement. While this office is not specifically defined as a windowless environment, the researcher believes many people might interpret a basement office as

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one with very restricted opportunities for a window and the associated properties of

natural light and view.

Table 4

Office Preferences

Ranking	1 Would Like Very Much	2 Would Like Somewhat	3 Neither Like Nor Dislike	4 Would Dislike Somewhat	5 Would Dislike Very Much
Office 1 (WW)	**109**	36	15	5	2
Office 2	42	46	**56**	16	7
Office 3	30	47	**66**	11	13
Office 4*	6	14	**88**	34	24
Office 5	45	47	**54**	8	13
Office 6 (WW)	31	**50**	42	27	17
Office 7 (WW)	31	**39**	**39**	36	22
Office 8	**74**	62	26	5	0
Office 9	28	**45**	30	33	31
Office 10 (WO)	6	19	33	**60**	49
Office 11	7	36	43	**44**	37
Office 12 (WW)	18	40	**63**	33	13
Office 13*	3	29	**85**	29	20
Office 14	24	48	**54**	30	11
Office 15 (WO)	7	17	40	50	**53**
Office 16	**71**	53	37	6	0
Office 17	33	**45**	43	33	13
Office 18 (IWO)	0	1	10	35	**121**
Office 19 (WO)	2	22	28	**70**	45
Office 20 (WW)	23	**46**	40	39	19
Office 21 (IWO)	4	25	43	**59**	36
Office 22	4	22	**98**	30	13
Office 23	18	51	**73**	18	7
Office 24 (IWO)	2	12	40	**68**	45
Office 25*	**82**	45	22	11	6

* Missing one response   n = 167

Abbreviations:(WW) The office scenario specifically mentioned the presence of a window.

(WO) The office scenario specifically mentioned the lack of a window.

(IWO) The office scenario inferred the lack of a window.

Part 2 of the questionnaire also supported the previous window preference findings. In Part 2, participants were asked to choose between a window and another office amenity in six different scenarios. The majority of participants chose the window over the other amenity in every situation (see Table 5).

Table 5

Windows vs. Other Office Amenities

	Frequency	Percent
Set 1: Window vs. Size		
Smaller Office With Window	144	86.2
Larger Office Without Window	23	13.8
Set 2: Window vs. Finishes		
Plain Finishes With Window	124	74.3
Better Finishes Without Window	43	25.7
Set 3: Window vs. Lighting		
Simple On/Off Lighting With Window	135	80.8
Multi-Level Lighting Without Window	32	19.2
Set 4: Window vs. Location		
Remote Location With Window	141	84.4
Preferred Location Without Window	26	15.6
Set 5: Window vs. Surrogate Views		
Minimal Personalization* With Window	115	68.9
Unlimited Personalization Without Window	52	31.1
Set 6: Window vs. Privacy		
Shared Office With Window	89	53.3
Private Office Without Window	78	46.7

*Personalization as defined on the questionnaire includes items such as plants, photographs, posters, art, etc.

n = 167

The results of both Parts 1 and 2 of the questionnaire appear to support Research Question 1 and the previous findings indicating a preference for windows in the workplace.

<div align="center">Research Question 2</div>

The second research question asked: What amenities will be deemed more desirable, equally desirable, or less desirable than windows? Part 1 of the questionnaire indirectly addresses this research question. The information collected in Part 1 is considered indirect because while participants were able to rank the desirability of each office scenario and the related amenities, they were not directly comparing the amenities mentioned to a windowed or windowless environment.

In Part 1, 4 of the 25 different scenarios received a rating of one, which was described as "would like very much". Of these four offices, one specifically mentioned the existence of a window. This office was described as an average size office (10' x 12') with a window. The other most desirable offices were (a) offices near co-workers in the same department, (b) offices where the occupants could select their own color scheme from several offerings, and (c) an office with room for more than just a desk, a chair, and a filing cabinet.

Four scenarios received a scale ranking of two or "would like somewhat". Two of these four scenarios specifically mentioned the presence of a window. A third office was described as quiet. The fourth scenario was an office where the employee had an opportunity to choose his own furniture style. In this situation, it was noted that the employee would be responsible for paying 25% of the cost of any non-standard furniture selections. Scenario 7, which was described as a 12' x 12' office with vinyl tile flooring, painted walls, and a window, received an equal number of two and three ratings.

The majority of scenarios received the overall neutral rating of three, "neither like nor dislike". Nine of the 25 scenarios received threes, with a tenth receiving an equal number of twos and threes, as mentioned above. Offices with the highest percent of neutral ratings were described as identical to all other offices in the department, located close to the supervisor, and located near the front entrance.

Five of the office environments were assigned the "would dislike somewhat" rating of four. One of these was described as an office located in an interior space near the employee lounge and washrooms. Another scenario noted a semi-private office shared with a co-worker of similar status and having adequate space for numerous pieces of furniture.

The remaining "would dislike somewhat" scenarios described offices without a window or natural light. In each of these three cases, another amenity had been offered to take the place of the window. Of these amenities, carpeting and wall covering, multiple types of artificial light, and the ability to personalize the office space with posters, photographs, and framed art, it appears that none were deemed more desirable than windows. In these three cases, an opposite scenario was presented somewhere among the 25 listings, i.e. an office with a window but with a lesser grade of the amenity. These comparisons were similar to the comparisons found in Part 2 of the questionnaire. In each occurrence, the windowed counterpart received a more favorable rating of two or three. This particular portion of Part 1 addresses Research Question 2 more directly because of the comparisons between amenities and windowed versus windowless environments.

Only 2 of the 25 scenarios received a rating of five, or "would dislike very much". One scenario was an office in the basement of a building. The other scenario described a large office (12' x 16') without a window. This scenario's counterpart, an

average size office (10' x 12') with a window, received the "would like very much" rating of one. Again, Research Question 2 is more directly addressed here by comparing the amenity of larger office size versus a window.

It appears that the amenities listed in the office scenarios which received scale ratings of one or two could be classified as amenities considered desirable by office workers. Likewise, the offices descriptions with scale ratings of four or five may be deemed undesirable. Direct comparisons between these amenities and windows have not been made except as noted.

Part 2 of the survey instrument directly addresses Research Question 2 by making specific comparisons between windows and other office amenities. In Part 2 of the questionnaire, Set 1 illustrated the greatest percentage of participants indicating the window preference, with 86.2% of respondents choosing the window over the larger office. In Set 2, 74.3% of the respondents selected a windowed office over an office with nicer finishes. Set 3 indicated 80.8% of the study population preferred a window more so than different levels and types of artificial light. Set 4 indicated the second highest preference for windows with 84.4% of participants choosing a window rather than an office in a convenient location within the building. In Set 5, 68.9% chose a window instead of the opportunity to add posters, plants, and photographs to personalize their offices and to provide surrogate views. While Set 6 still indicates a preference for the window, it is by the smallest margin. Only 53.5% of the respondents were willing to share an office in order to have a window within their workspace.

The findings of Part 2 indicate that of the six amenities offered; size, level of finish, lighting, location, surrogate views/personalization, and privacy, none appear to be more desirable than windows. The only amenity which seems to be almost as

desirable as a window is privacy. If none of the six amenities were found to be more desirable than windows, all must be considered less desirable than windows.

Additional Analysis

In addition to Research Questions 1 and 2, other questions have arisen. Were there correlations between the responses? Did participants respond consistently or were there response differences based on differences in the sample population?

Additional analysis found positive correlations between office size and finishes, lighting, location, surrogate views and privacy (See Table 6). These correlations indicate respondents who preferred a window over the amenity of a larger office size also preferred a window over all the other amenities offered to them. Positive correlations were also found between finishes and lighting, surrogate views, and privacy; between lighting and location, surrogate views, and privacy; and between location and surrogate views. These responses were consistent. Respondents who wanted windows in their workspaces, wanted windows more than any other amenity. Even in cases where the correlations were not statistically significant, there was consistency in the responses.

Respondent gender affected the window preference correlation. A negative correlation was found between gender and office size, finishes, lighting, and privacy. This indicates women significantly prefer a window over the amenities of size, finishes, lighting, and privacy.

A positive correlation between the number of years worked in the current profession and privacy and age was also noted. This indicates the more years respondents have worked in the current profession, the more likely they were to want a private office rather than a window. This also indicates the obvious correlation that older workers were more likely to have worked more years in their current profession.

Table 6

Correlations of Additional Findings

	Finishes	Lighting	Location	Surrogate	Privacy Views	Gender	Age	Prof. Years	Education
Size	+	+	+	+	+	-	NS	NS	NS
Finishes		+	NS	+	+	-	NS	NS	NS
Lighting			+	+	+	-	NS	NS	NS
Location				+	NS	NS	NS	NS	NS
Surrogate Views					NS	NS	NS	NS	NS
Privacy						-	NS	+	NS
Gender							NS	NS	-
Age								+	NS
Prof. Years									NS
Education									
Job Classification									
Current Work Environment									
Comp. Hours									
Comp. Desk									
Type Of Employment									
Office Population									

+   Correlation is significant and positive.
-     Correlation is significant and negative.
NS   Correlation is not significant.

Table 6, continued

_____

	Job Class.	Current Work Environment	Comp. Hours	Comp. Desk	Type of Employment	Office Population	Current Window	
Size	+	NS	NS	NS	NS	NS	+	
Finishes	+	-	NS	NS	NS	NS	+	
Lighting	NS	NS	NS	NS	NS	NS	NS	
Location	NS	NS	NS	NS	+	NS	NS	
Surrogate Views		NS	NS	NS	NS	NS	+	+
Privacy	+	-	NS	NS	NS	NS	+	
Gender	-	+	NS	NS	+	NS	-	
Age	+	NS	-	+	NS	NS	-	
Prof. Years	+	-	-	NS	-	NS	NS	
Education	+	NS	NS	NS	NS	NS	NS	
Job Classification		-	NS	NS	-	NS	NS	
Current Work Environment			NS	+	NS	NS	NS	
Comp. Hours				-	NS	+	+	
Comp. Desk					NS	-	-	
Type of Employment						-	NS	
Office Population							+	

Abbreviations: Prof. Years   Number of years in the current profession?
               Comp. Hours   Number of hours per day spent working on a computer?

               Comp. Desk   Is there a computer at your desk?
               Current Window   Is there a window in your current workspace?

Privacy was the only issue salient to years in the profession. Analysis indicated that as actual privacy declines, the more important a window becomes to the respondent.

Positive correlations were found between respondents who currently have a window in their workspaces and the amenities of size, finish, surrogate views, and privacy. Female respondents were less likely than men to have a window in their current workspace. Being employed in a full-time position was positively correlated to wanting a better office location. Part-time workers were more likely to want the window in lieu of the better location. The greater number of people employed in the office was positively correlated to the desire to have surrogate views and being able to personalize offices.

With regards to the number of hours spent on a computer, a negative correlation was found between the number of hours spent per day on the computer and age and computer usage hours and years working in the profession. This indicates that older respondents and those who have worked longer in the profession were less likely to use a computer. Respondents from larger offices were also found to spend more time working on a computer.

The job classification variable created some measurement problems. The managerial and professional classifications were not well defined. It was necessary for respondents to arbitrarily assign themselves to a category. Despite the problems, the analysis finds that as skill levels increased, respondents were more likely to choose amenities over the window.

CHAPTER V

SUMMARY AND DISCUSSION

In summary, the findings support Research Question 1. The data gathered in both Parts 1 and 2 of the questionnaire indicate office workers prefer windows in their workspaces, thus supporting the window preference findings of the literature review. In Part 1, all office scenarios described as having a window received favorable Likert scale rankings of one or two, or the neutral rating of three. All office scenarios inferring or making specific mention to being windowless received unfavorable scale ratings of four or five. In Part 2, a window was chosen as being the most desirable amenity among six other choices.

Research Question 2, seeking to pinpoint amenities more, less, or as equally desirable as a window, was indirectly addressed by the data from Part 1 of the questionnaire. The offices which were deemed most desirable featured the following four amenities: (a) a window; (b) an opportunity to select the color of the office; (c) an office with room for more than just a desk, chair, and filing cabinet; and (d) a location near co-workers in the same department. The least desirable offices were described as an office without a window and an office in the basement.

Data from Part 2 of the questionnaire indicate that windows are the most desirable amenity in an office. Of the six amenities offered; size, finishes, lighting, location, surrogate views/personalization, and privacy, a windowed office was chosen over the higher grade of each amenity in every case. Privacy was the only amenity

which was selected almost as often as the window. In interpreting this, it might be said that privacy is an amenity equal, or nearly equal, in importance to a window. No amenity was deemed to be more important than the window. Of the six amenities offered, all were considered less desirable than a window.

Applications

Obviously not all office workers have windows located within their workspaces. Unless office design in the United States begins to change drastically and reflect some of European design trends, many workers will be without windows in their immediate work environments (Becker & Steele, 1995b). What can the office designer do for those employees who do not have windows in their workspaces to help increase satisfaction with their work environments?

Designers should do as much as possible to create satisfying work environments for all employees. Based on the findings of this study, it is recommended that building designers provide private offices rather than shared work environments when windows are not available. It is important that employees have an opportunity to personalize their windowless offices with posters and photographs. Providing tackboards or other tackable wall surfaces in offices would allow employees to personalize their offices without damaging the walls. Personalizing walls only in designated areas might also alleviate problems of wall clutter and unprofessional office appearance.

Another possibility is allowing workers to choose the color of their office from several predetermined coordinated offerings. Having input in the type of furniture selected is also important. The options of office personalization and color and furniture selection might help employees achieve a sense of user control. User control is believed to be significant to the sense of perceived well-being (Bordass, 1993).

Workers also indicated a preference for an office spacious enough to accommodate more than just a desk, chair, and filing cabinet. Furniture arrangement is one of the physical factors associated with feelings of being crowded (Gifford, 1997). By giving employees a little more breathing room in their offices, they may be more satisfied with their immediate work environment. In offices without windows, the extra space might help alleviate feelings of confinement.

Heerwagen (1989) believes that architects and landscape designers should work together when designing a building to offer the building occupants optimum window views. The exterior landscaping should be for the benefit of the workers inside, not for the benefit of passersby. Murals of outdoor scenes and plants can be used to enhance building interiors along with curvilinear lines, areas of gradual shading, and the duplication the irregular lines, shapes, and forms found in a nature.

To help to relieve the confining qualities of windowless, underground offices, Sommer (1974) suggests the addition of aquariums, terrariums, plants, and flowers. These items might serve as window substitutes. The use of textured fabrics and paneling would also help to alleviate the look of a basement.

Suggestions for Future Research

One obvious suggestion for future research would be an increased sample size. While the current sample was adequate to explore the research questions, a larger sample might have increased the number of significant correlations found in the correlation coefficient calculations. These correlations were a part of the additional research findings.

This study was limited to a small geographical area of the United States, i.e. northeastern Ohio and western Pennsylvania. In the current study's climate, participants most likely spend a majority of the year indoors. It would be interesting

to explore responses to the same questionnaire in warmer climates such as Georgia, and South Carolina. Future research might be conducted in more temperate areas where participants would have an opportunity to be outdoors more often. Areas with extreme heat and cold such as Arizona or Alaska could be investigated as well.

Another climate related variable to be researched is a sunny climate versus a cloudy one. In northeastern Ohio and western Pennsylvania, where the sky is often overcast, people seem to value a sunny day. In Cleveland, Ohio, 48% of the days are cloudy. Pittsburgh, Pennsylvania averages cloud cover 46% of the year while Akron, Ohio has cloudy skies 45% of the year (Williams, 1994). In the southwestern United States, where cities such as Yuma, Arizona and El Paso, Texas have sunny skies 83% - 90% of the time, do office workers hold the same opinions about windows? Cities such as Miami, Florida and Honolulu, Hawaii both have very constant temperatures throughout the year with a 15% average cloud cover. Again, would office workers from these areas hold the same opinion as this sample population? It would be interesting to investigate the preference for a window in an area where sunlight and warm temperatures are an everyday occurrence.

This study was also limited to the physical existence of the window within a workspace. While the partiality for a window may be closely linked to the view a window provides, the actual view was not explored as a part of this study. Future research questionnaires could pinpoint and describe particular views; urban, rural, scenic, coastal, mountainous, and the like. The preference for windows might change depending upon the available view. Participants likes and dislikes for particular scenery could play a critical role in their responses. For example, while one respondent might enjoy a wilderness view, another respondent with a fear of the wild might find the view unsettling. The current study took a neutral approach to the view

variable by excluding mention on any window views.

One final suggestion for further research would be to investigate the preference for windows in individual workspaces when common areas of the building offer large areas of glass. These office buildings would need to have large atriums, solariums, or expansive window walls in areas where employees gather such as lunch rooms, lounges, or conference areas. When office workers have abundant window views in common areas of the building, is an individual office window as important or would other office amenities begin to be preferred?

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