Servicescape: Physical environment of hospital pharmacies and hospital pharmacists’ work outcomes

Blossom Yen-Ju Lin
Wen-Jye Leu
Gerald-Mark Breen
Wen-Hung Lin

Background: In health care, architects, interior designers, engineers, and health care administrators need to pay attention to the construction and design of health care facilities. Research is needed to better understand how health professionals and employees perceive their work environment to improve the physical environment in which they work.

Purpose: The purpose of this study was to test the effect of the physical environment of hospital pharmacies on hospital pharmacists’ work outcomes.

Methodology: This cross-sectional mailed survey study of individual hospital pharmacists used a structured questionnaire developed to cover perceptions of the ambient conditions and the space/function(s) of pharmacists’ work environments. It included aspects such as dispensing areas, pharmaceuticals areas, storage areas, and administrative offices. Work outcomes were job satisfaction, intentions to leave or reduce job working hours, and job-related stress. Hospital pharmacists in Taiwan (n = 182) returned the mailed surveys. Structural equation modeling was performed to validate the construct of the physical environment of a hospital pharmacy and the causal model for testing the effect of the physical environment on pharmacists’ work outcomes.

Findings: For hospital pharmacy workplaces, more favorable perceptions of the workplace’s physical environment were positively associated with overall job satisfaction, but such perceptions were also negatively related to intentions to quit employment or to reduce working hours. However, the effect of the physical environment on job stress within the workplace was not supported.

Practice Implications: The designs of physical environments deserve attention to create more appropriate and healthier environments for hospital pharmacies. Further research should be devoted to trace more psychological responses to the physical environment from a longitudinal perspective.

Health care work environments of employees have been described by organizational behavior professionals in dimensions ranging from intangible psychological to tangible physical conditions (Allvin & Aronsson, 2003). The psychological dimension refers to work situations in line with the concept...
proposed by two-factor theory, which emphasizes employees’ inner “motivation” factors such as growth and enrichment and outer “hygiene” factors such as rewards, supervision, effectiveness of organization, fellow employees, and others (Ivancevich & Matteson, 1996; Wineman, 1982). On the other hand, occupational and environmental professionals perceive a healthy work environment in more physical terms, emphasizing employees’ physical comfort levels, including ambient conditions, ergonomics, privacy and social integration, and symbolic identification (Steele, 1973; Wineman, 1982). The concept of “servicescape” has been used in marketing and health care marketing to emphasize the impact of physical environments on employees in service settings through emotional, affective, cognitive, and psychological states and perceptions (Bitner, 1992; Hutton & Richardson, 1995). In a similar vein, other researchers have studied constructs from the pathogenic perspective, including the reduction of exposure risks to diseases, in addition to the psychological, social, and spiritual needs according to the salutogenic perspective, which focuses on health promotion processes in health care facilities (Dilani, 2000).

This study could very well serve as the first to consider pharmacists’ perceptions of their working environments, which is different from similar studies characterizing the health of the working environment in the health care industry from a more psychology-oriented perspective (Desselle & Holmes, 2007; Mott, Doucette, Gaither, Pedersen, & Schommer, 2004) or job-characteristics perspectives (Lin, Yeh, & Lin, 2007). This study extends and expands on the concept of servicescapes in the health care industry and tries to verify the importance of the physical environment on work outcomes in health care workplaces from a theoretical perspective and according to evidence-based research, especially via structural equation modeling that factored in overall job satisfaction, intention to quit or reduce working hours, and job stress.

Theoretical/Conceptual Framework

The Role of Physical Environments in the Workplace

From a marketing or health marketing perspective, Bitner (1992) presented a framework of servicescape for service organizations to examine the effect of the physical environment on both customers and employees, with an emphasis on the impact of physical environments on employees in service settings through the emotional, affective, cognitive, and psychological statuses and perceptions. In turn, these lead to employees’ behavioral consequences including enhancing affiliation, exploration, longer stay, commitment, and complete plan; these behaviors may produce desirable outcomes of quality, values, satisfaction, willingness to return, and willingness to recommend the providers (Hutton & Richardson, 1995). Steele (1973) identified a set of physical environmental needs for the health and well-being of employees, including physical comfort, task instrumentality, privacy and social integration, and symbolic identification. The physical comfort aspect of the ambient conditions includes heating, ventilation, and air conditioning. Ergonomics, task instrumentality, focuses on body dimensions and the physical capabilities of the workers (with physical design), including the space/function(s) of the furnishings, layout and size of the workplace, as well as the adequacy and arrangement of work groups and support services; these factors each can influence personal comfort and efficiency levels with respect to performing tasks. Privacy refers to the design and management of the physical environment which influences workers’ communication and their abilities to obtain visual and acoustical privacy. Visual privacy refers to privacy from the view of others. Acoustical privacy refers to a separation from annoying noises, such as nearby and audible telephone conversations and social talking, the sound level, and the level of background sound; these privacy factors have the ability to interfere with the level of task performance. Social interaction comprises relationships with peers, supervisors, and subordinates in supportive social relationships that can reduce the severity of perceived workloads. Finally, symbolic identification refers to status markers, which reflects an occupant’s status; these include the space size, the amount of enclosure provided by walls, partitions, and doors; the location of an office; and the amount and quality of furnishings (Wineman, 1982).

Physical comforts on employees’ work outcomes. Barnaby (1980) found that lighting conditions in workplaces are positively related to workers’ productivity, accuracy, and satisfaction, yet they are negatively related to work errors. Donchin and Seagull (2002) argued that lighting affects providers’ stress levels. Gottardi (1998) described how a film library supervisor in a hospital asked the staff members to respond to the positive and negative aspects of their work space to design better soundproofing, lighting, and storage space. Niemela, Rautio, Hannula, and Reijula (2002), in a study of employees of storage facilities, found that improved work environments, specifically those that had better thermal climate and better lighting conditions, are related to increased productivity. Hashiguchi, Hirakawa, Tochihara, Kaji, and Karaki (2005) examined the thermal environment (temperature and humidity) and the symptoms of nurses and nurse aid staff in sickrooms, nursing stations, and corridors in a hospital during the winter season and found that most
staff members were working while having itchy skin and thirstiness due to low humidity. Staff members of postanesthesia care units have positive attitudes toward a designed music environment (Thorgaard et al., 2005). An interesting finding was that cleanliness and orderliness of the work sites were main determinants for hospital employees’ compliance with safe work practices (Gershon et al., 2000).

**Task instrumentality on employees’ work outcomes.** Better ergonomic design for keyboard height, drawers, and even the height of the sliding glass window in the reception area was recommended by the staff members in a hospital’s film library for creating the positive aspects of their work space (Gottardi, 1998). Del Nord (1999) highlighted that the humanization of spaces (i.e., layouts, technology, furniture and furniture designs, and ways finding) is an important physical environment factor for hospital architectures, often influencing employees. A natural quasi-experimental longitudinal field study was examined to determine the effects of an office station’s ergonomics intervention program on employees’ perceptions of their workstation characteristics, level of persistent pain, eyestrain, and workstation satisfaction. It was found that workstation improvements led to more positive perceptions of the workstation (May, Reed, Schwoerer, & Potter, 2004). Mrozcek, Mikitarian, Vieira, and Rotarius (2005) studied employee satisfaction in a medical center and found that the building design may produce a significant impact on staff satisfaction. Rumreich and Johnson (2003) surveyed the Indiana University faculty radiologists and indicated that the faculty members are least satisfied with their work space ergonomics, room layouts, and amount of work space, yet 98% of respondents indicated that ideal environments would have a positive effect on their work efficiency.

**Privacy and social integration on employees’ work outcomes.** Most previous studies were majorly focused on the acoustical privacy factors, including annoying noises, the sound levels, and the level of background sounds. Heerwagen, Heubach, Montgomery, and Weimer (1995) contended that physical environments lacking control over the environment are characterized as having distractions from coworkers, lacking privacy, being noisy and crowded, and having environmental deprivations. Such environments play an important role in occupational stressors. Melamed, Fried, and Froom (2001) determined that exposure to occupational noise has a negative effect on changes in blood pressure and job satisfaction over time and among employees performing complex tasks and in stress (Donchin & Seagull, 2002). Walsh-Sukys, Reitenbach, Hudson-Barr, and DePompei (2001) examined neonatal intensive care units and put forward that staff members were highly satisfied with reductions in sound levels. In a noise study in an ambulatory health care setting, Schuster and Weber (2003) found that a quiet environment resulted in an overall positive environment for the employees by increasing productivity and reducing stress.

**Symbolic identification on employees’ work outcomes.** Folkins, O’Reilly, Roberts, and Miller (1977) examined new and old mental health clinic buildings and found that the mental health team staff members who relocated to new satellite clinics reported significant increases in satisfaction with their physical surroundings, whereas those staff members located in the old central clinic buildings were less satisfied. Furthermore, satisfaction with physical surroundings held some degree of influence on overall staff satisfaction ratings and might be a mediating variable for staff morale and effectiveness. Tyson, Lambert, and Beattie (2002) examined the old and new wards of a rural psychiatric hospital and found that the newly constructed wards were associated with primarily positive changes in nursing staff’s behavior, burnout, and job satisfaction.

**Characteristics of Hospital Pharmacists’ Workplaces in Connection to Proposed Model and Hypotheses**

Hospital pharmacies are the major employers of pharmacists in Taiwan, based on the statistics from the national medical and pharmaceutical workforce reports (www.doh.gov.tw). There are 21.7% more pharmacists in hospitals than other health care settings, according to those from the 2003 Taiwan Actively Practicing Pharmacist List. There are several distinct differences in Taiwanese hospital pharmacists as compared with those in Western nations. First, Taiwanese hospital pharmacies are important not only with regard to inpatient services, but also with respect to outpatient dispensing services. Hospital-based outpatient dispensing prescriptions account for 25% of all outpatient dispensing prescriptions in Taiwan (www.doh.gov.tw). Second, in Taiwan, the hospital pharmacists’ professional relationships encompass physicians and nurses, as well as direct relationships with outpatients and often indirect relationships with inpatients via nurses. The components and responsibilities of pharmacists’ work in hospital pharmacies include the provisions of drug information to patients including recommending medications, monitoring drug therapy, and prescription and dispensing management. The provision of pharmacists’ consultations to physicians and the community at large is also a common task. In addition, hospital pharmacists also
engage in general management (planning, organizing, leading, and controlling), inventory management, human resource management, marketing management, and financial management of pharmacies (Lin et al., 2007).

Dilani (2005) pointed out that hospital employee’s workplaces have been limited to indoor environments, with more than 80% of their working time spent indoors within these hospital settings. Moreover, hospital pharmacists spend almost the whole business day in indoor working environments, including the basement portions of the buildings, where many hospitals carry out most of their pharmaceutical functions (ranging from dispensing rooms to the storage rooms). This article partly expands Bittner’s (1992) servicescape concept for service organizations to examine the effects of the physical environment on employees’ work outcomes, along with information from the employees’ perspectives. From the literature reviewed, we thus evaluate the impact of hospital pharmacists’ perceptions of the physical environment of hospital pharmacies on these employees’ work outcomes.

The proposed conceptual framework is shown in Figure 1. The physical environments of hospital pharmacies were composed of hospital pharmacists’ perceptions of dispensing areas (outpatients, inpatients, and emergency); pharmaceutical areas; storage areas; and administrative offices in hospital pharmacies. The hospital pharmacists’ work outcomes factored in overall job satisfaction, intention to leave or reduce working hours, and job-related stress. In addition, several previous studies have raised the point that human demographics could play important roles in the individual’s perceptions of the physical environment. For example, Bortkiewicz et al. (2006) found that female workers seemed to be more sensitive to stress of cold climates than male workers. In a similar vein, age and gender might be risk factors for neck pain in the workplace (Hush, Mahler, & Refshauge, 2006). Satisfaction with the physical environment of outpatient waiting areas was associated with gender and age (Tsai et al., 2007). In addition, a pharmacists’ working duration (in terms of years worked) as pharmacy professionals—and in the surveyed pharmacy—could be a potential confounding variable on how pharmacists perceive their physical environment in their workplaces because humans might adapt or adjust to their surroundings as their working careers lengthen.

Therefore, using individual hospital pharmacists as a unit of analysis, the hypothesized relationships are shown in Figure 1 and are listed below:

### Hypotheses

- **H1**: Controlling personal background characteristics, hospital pharmacists’ perceptions of the physical environment in hospital pharmacies are positively associated with their job satisfaction.
- **H2**: Controlling personal background characteristics, hospital pharmacists’ perceptions of the physical environment in hospital pharmacies are negatively associated with their intentions to leave their jobs.
- **H3**: Controlling personal background characteristics, hospital pharmacists’ perceptions of the physical environment in hospital pharmacies are negatively associated with their intentions to reduce their working hours.
- **H4**: Controlling personal background characteristics, hospital pharmacists’ perceptions of the physical environment in hospital pharmacies are negatively associated with their job stress.

## Methods

This was a cross-sectional mailed survey study. Using individual hospital pharmacists as the unit of analysis, this study examined the effect of hospital pharmacists’ perceptions of the physical environment of hospital pharmacies on their work outcomes. The study participants and sampling, survey instrument development, and analytical techniques are as follows.

### Study Participants

The study population consisted of 5,551 hospital pharmacists listed in the 2003 Taiwan Actively Practicing Pharmacist List. All sampled pharmacists were selected using systematic sampling, whereby each member of the study population was selected using systematic sampling, whereby each member of the study population was assembled and listed with the hospital accreditation levels (the first stratified variable) and administrative geographical locations (city/county; the second stratified variable) because facility scales might have different equipment and designs in the physical environments of pharmacies across different hospital accreditation levels. We also wanted to capture the representativeness of hospital pharmacists across national geographical locations to include the various rural–urban areas. A random start number (4,675) was designated in this study. Members of the population were selected at equal intervals to collect a total of 1,110 hospital pharmacists as our sample participants. Structured questionnaires were distributed by mail from February 2005 to April 2005.

### Survey Instrument

**Physical environment measures.** First, the structured questionnaire was drafted from the theoretical and practical literature and focus groups of pharmacists to construct four major working spaces of hospital
pharmacists: (1) dispensing areas, (2) pharmaceutical areas, (3) storage areas, and (4) administrative offices. Under each type of space, the ambient conditions (e.g., temperature, air quality, music, odors, lighting, textures, etc.) and space/function(s) (e.g., crowding, equipment, furnishings, layout, etc.) of pharmacists’ working
environments were identified (Hutton & Richardson, 1995). This led to 45 items for descriptions of dispensing areas (15 items each for outpatient, emergency, and inpatient dispensing areas); 16 for pharmaceutical areas; 14 for storage areas; and 12 for administrative offices. The structured questionnaires were examined by two professors for theoretical accuracy and three senior practicing pharmacists (including a pharmacy chief) to ensure the ability for accurately capturing possible hospital pharmacists’ physical working environments. One pilot study was pretested for 15 hospital pharmacists across different hospital accreditations as there are various possible working conditions of physical environments. The wordings and meanings of each question item were confirmed to assure content validity, and factor analyses were performed for individual dimensions of physical environments of hospital pharmacies, including outpatient dispensing areas, emergency dispensing areas, inpatient dispensing areas, pharmaceutical areas, drug storage areas/rooms, and administrative office areas for construct validity. The reliability values, calculated by Cronbach’s alpha, for individual dimensions of physical environments of hospital pharmacies range from .94 to .98 (see Table 1). All items were measured on 5-point Likert scales, with 1 representing least satisfied and 5 representing most satisfied. A question item with which the respondents had no experience was recorded as “not applicable.”

**Work outcome measures.** Hospital pharmacists’ work outcomes were measured in terms of four variables: (1) job satisfaction, (2) intention to leave the job, (3) intention to withdraw working hours, and (4) job stress. Four variables were measured applying 0–100 as scores, with higher scores meaning higher inclination of measured work outcomes. Information about each pharmacist’s gender, age, education, work experience, working hospital accreditation, and geographic distribution was also collected.

### Table 1

<table>
<thead>
<tr>
<th>Dimensions of physical environments</th>
<th>Number of items</th>
<th>M</th>
<th>SD</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Outpatient dispensing areas</td>
<td>15</td>
<td>3.11</td>
<td>0.66</td>
<td>0.94</td>
</tr>
<tr>
<td>2. Emergency dispensing areas</td>
<td>15</td>
<td>3.18</td>
<td>0.65</td>
<td>0.96</td>
</tr>
<tr>
<td>3. Inpatient dispensing areas</td>
<td>15</td>
<td>3.20</td>
<td>0.63</td>
<td>0.95</td>
</tr>
<tr>
<td>4. Pharmaceutical areas</td>
<td>16</td>
<td>3.28</td>
<td>0.54</td>
<td>0.98</td>
</tr>
<tr>
<td>5. Storage areas/rooms</td>
<td>14</td>
<td>3.24</td>
<td>0.62</td>
<td>0.96</td>
</tr>
<tr>
<td>6. Administrative areas</td>
<td>12</td>
<td>3.22</td>
<td>0.70</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Note. The instrument is available upon request.

**Analytical Techniques**

The data were analyzed applying descriptive analysis, including the means and standard deviations for continuous variables and frequency and percentage for categorical variables. The mean method was used to aggregate perception scores of the individual question items for inpatient dispensing area, outpatient dispensing area, and emergency area, respectively.

The multivariate statistical approach conducted in this study was the structural equation model (SEM), also known as linear structural relationships and the covariance structural model. Two parts were performed in the SEM or linear structural relationships model: One employed the measurement modeling, whereas the other used structural equation modeling. The measurement model was first used to validate how the latent variables were measured by the observed indicators. The second-order measurement model (physical environments of hospital pharmacists) is presented in Figure 2, with the following four indicators: (1) dispensing areas, (2) pharmaceutical areas, (3) storage areas, and (4) administrative areas. The dispensing area indicator was also indicated by three factors: (1) outpatient dispensing areas, (2) inpatient dispensing areas, and (3) emergency dispensing areas.

After the measurement models were validated, the SEM was performed to specify the causal relationship among exogenous and endogenous variables. All analytical processes involved model construction, parameter estimation of the model, test for the fit of the model, and model modification, using the maximum likelihood estimation procedure (Bollen, 1989). The SEM was designed to test our hypotheses. The hypotheses were empirically examined using a two-tailed test for their statistical significance at the .05 or at a lower level. Because the multivariate analysis was performed for testing the hypotheses, the conclusions drawn from the results can be stated as the net effect of a given predictor on the endogenous variable while other variables are simultaneously being controlled.
Satisfactory model fit includes the following: (a) a nonsignificant chi-square test ($p > .05$), (b) root mean square error of approximation (RMSEA) values less than .08, (c) $P_{\text{CLOSE}}$ (close fit) values larger than .05, (d) Hoelter’s critical $N$ values larger than 200, and (e) normed fit index (NFI) and comparative fit index (CFI) for model goodness-of-fit larger than .90 (Arbuckle, 2005). Statistical analyses were performed using SPSS 12.0 software for descriptive analyses, factor analyses, and reliability analyses. The AMOS 6.0 software was used for the structural equation modeling.

### Findings

This study aimed to portray the physical working environments for hospital pharmacists and to explore their effects on hospital pharmacists’ work outcomes. The respondents were 182 hospital pharmacists, with a 16.4% response rate (100% × 182 respondents/1,110 sampled). Most hospital pharmacists were female, with undergraduate degrees, and were less than 40 years old. The average work experience as pharmacists was 10.0 years, and the average work experience working in the surveyed hospital pharmacies was 6.7 years. There were no significant differences between the study population and pharmacists who responded regarding the background information related to gender, age, hospital accreditation, and geographical distribution ($p > .05$). Other detailed pieces of personal information of respondents are shown in Table 2.

### Descriptive Analyses of the Perceived Satisfaction of Physical Environments

According to the item-by-item examination of the physical environments of hospital pharmacies, most items, on average, showed higher satisfaction scores over 3.0. Seven items were ranked with lower scores for physical environment, including space design of the outpatient dispensing table ($M = 2.94$); functional design of the outpatient dispensing table ($M = 2.98$); noise of drug-related equipment in outpatient areas ($M = 2.53$), emergency areas ($M = 2.89$), and inpatient areas ($M = 2.89$); interior design of storage areas ($M = 2.99$); and space design of administrative areas ($M = 2.93$). In addition to the mean and standard deviation being used to understand the distributions across perceived satisfaction with the physical environment of hospital pharmacies, the frequencies (percentages) were also shown to allow the hospital administrators to capture...
more information on the “dissatisfied” values of the respondents rather than just reading the “moderate” values (i.e., 3.00 as the neutral score in this study) by means and then assuming that everything was close to being fine (data not shown).

### Measurement Model of Physical Environment of Hospital Pharmacies

For the measurement models in this study, the second-order construct of physical environments of hospital pharmacies was examined. Figure 2 shows that the factor loadings for all indicators were significant at the .05 level. The validated model was used for analyzing the causal model in the next analysis. The overall model of the measurement model was shown as a good fit for the criteria in this study, including a nonsignificant chi-square test ($\chi^2 = 6.66; p = .57$ in this study), RMSEA values less than .08 (.00 in this study), P_CLOSE (close fit) values larger than .05 (.82 in this study), Hoelter's critical N values larger than 200 (422 in this study), and NFI and CFI for evaluating the goodness-of-fit larger than 0.90 (0.99 and 1.00, respectively, in this study).

### Analysis of the Causal Model: Test of Hypotheses

After validating the measurement models, the SEM was performed. Most endogenous variables (working physical environment and job outcomes) were moderately correlated with each other. However, we observed that several exogenous variables were highly correlated (Table 3);
Correlation matrix analysis of the studied variables

<table>
<thead>
<tr>
<th></th>
<th>OUT</th>
<th>ER</th>
<th>INP</th>
<th>PHA</th>
<th>STO</th>
<th>ADM</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT</td>
<td>1</td>
<td>0.80***</td>
<td>0.79***</td>
<td>0.63***</td>
<td>0.58***</td>
<td>0.64***</td>
</tr>
<tr>
<td>ER</td>
<td>0.83***</td>
<td>1</td>
<td>0.60***</td>
<td>0.61***</td>
<td>0.64***</td>
<td>0.38***</td>
</tr>
<tr>
<td>INP</td>
<td>0.64***</td>
<td>0.60***</td>
<td>1</td>
<td>0.63***</td>
<td>0.64***</td>
<td>0.37***</td>
</tr>
<tr>
<td>PHA</td>
<td>0.62***</td>
<td>0.57***</td>
<td>0.61***</td>
<td>1</td>
<td>0.63***</td>
<td>0.37***</td>
</tr>
<tr>
<td>STO</td>
<td>0.60***</td>
<td>0.55***</td>
<td>0.64***</td>
<td>0.63***</td>
<td>1</td>
<td>0.37***</td>
</tr>
<tr>
<td>ADM</td>
<td>0.49***</td>
<td>0.42***</td>
<td>0.42***</td>
<td>0.38***</td>
<td>0.37***</td>
<td>1</td>
</tr>
<tr>
<td>SAT</td>
<td>0.49***</td>
<td>0.42***</td>
<td>0.42***</td>
<td>0.38***</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>LEA</td>
<td>-0.24***</td>
<td>-0.23**</td>
<td>-0.19*</td>
<td>-0.27***</td>
<td>-0.21**</td>
<td>-0.18*</td>
</tr>
<tr>
<td>RED</td>
<td>-0.26***</td>
<td>-0.24***</td>
<td>-0.21**</td>
<td>-0.22**</td>
<td>-0.23**</td>
<td>-0.15*</td>
</tr>
<tr>
<td>STR</td>
<td>-0.18*</td>
<td>-0.16*</td>
<td>-0.12</td>
<td>-0.10</td>
<td>-0.09</td>
<td>0.01</td>
</tr>
<tr>
<td>GENDER</td>
<td>0.22**</td>
<td>0.20**</td>
<td>0.20**</td>
<td>0.13</td>
<td>0.21**</td>
<td>0.18*</td>
</tr>
<tr>
<td>AGE</td>
<td>0.17*</td>
<td>0.09</td>
<td>0.12</td>
<td>0.15*</td>
<td>0.15*</td>
<td>0.10</td>
</tr>
<tr>
<td>WORKP</td>
<td>0.11</td>
<td>0.07</td>
<td>0.08</td>
<td>0.08</td>
<td>0.08</td>
<td>0.03</td>
</tr>
<tr>
<td>WORKH</td>
<td>0.09</td>
<td>0.04</td>
<td>0.04</td>
<td>0.11</td>
<td>0.07</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Note. OUT: outpatient dispensing areas; INP: inpatient dispensing areas; ER: emergency dispensing areas; PHA: pharmaceutical areas; STO: storage areas; ADM: administrative areas; SAT: job satisfaction; LEA: leaving intention; RED: intention to reduce working hours; STR: job stress; AGE: age; GENDER: gender; WORKP: work years as pharmacists; WORKH: work years in surveyed pharmacy.

* p < .05.
** p < .01.
*** p < .001.

for example, hospital pharmacists’ age was positive and highly correlated with their working years as professional pharmacists (r = .83, p < .001), and hospital pharmacists’ professional experience was positive and highly correlated with their working years in the surveyed hospital pharmacy (r = .75, p < .001). To avoid the multicollinearity among the exogenous variables (i.e., confounding variables), the variable, that is, a hospital pharmacist’s working years as a pharmacy professional, was excluded in the final structural equation modeling (Table 4). The results reveal that hospital pharmacists’ satisfaction of physical environments was positively related to their job satisfaction and negatively related to the intention of quitting or reducing work hours, controlling for the hospital pharmacists’ age, gender, and working experience (in years) in the surveyed hospital pharmacies. However, there was no statistically significant relationship between perceived satisfaction with the physical environments and perceived job stress. In addition, male pharmacists had higher perceived satisfaction with the physical environment than the female pharmacists had (p < .01). The overall model of the causal effects was shown as a good fit in this study, according to the five criteria, including the following: (1) nonsignificant chi-square test ($\chi^2 = 32.55; p = .88$ in this study), (2) RMSEA values less than .08 (.00 in this study), (3) P_CLOSE (close fit) values larger than .05 (1.00 in this study), (4) Hoelter’s critical N values larger than 200 (330 in this study), and (5) NFI and CFI for evaluating the goodness-of-fit larger than 0.90 (0.97 and 1.00, respectively, in this study).

Discussion

To understand the effect of a physical environment on employee’s work outcomes, this study surveyed hospital pharmacists as the unit of analysis. The analyses confirmed three of four hypotheses proposed in this study; that is, better perceptions of the physical environment in the workplace were positively associated to overall job satisfaction (H_a) but negatively related to the intention of leaving the job (H_b) or reducing working hours (H_c). However, the hypothesis about the effect of the physical environment on job stress in the workplace (H_d) was not supported in this study. Other findings indicate that male pharmacists had higher perceived satisfaction than female pharmacists had with regard to the physical environment. Furthermore, the overall model of the causal effects was shown to have a good fit.

In this study, the relationship between the physical environment of hospital pharmacies and hospital pharmacists’ job stress was not verified in line with previous
studies pointed out by Heerwagen et al. (1995) and Schuster and Weber (2003). Wolfgang, Kirk, and Shepherd (1985) surveyed practicing pharmacists in Texas, and two broad categories were identified as the highest ranking stress scores: working conditions (such as interruptions, inadequate staffing, problems with policies and procedures, third-party paperwork, and time pressures) and motivators (such as not taking part in decision making, advancement, improved use of abilities, and challenging jobs). That might be the reason the role of physical environments appears to be relatively lower when compared with those highest ranking stress factors.

We anticipate further inspecting or investigating the real mechanisms of hospital pharmacists’ job stress in the future other than the physical environment perspective of hospital pharmacies. Also for future research, it might prove interesting to devote energy toward tracing more psychological responses to physical environments from a longitudinal perspective.

From a methodological perspective, this study uses multiple indicator modeling to validate the measurement model’s goodness-of-fit for the underlying construct of the physical environment of hospital pharmacies. Simultaneously, the SEM examines the relationships among the tested factors for methodological rigor. However, the low response rate (16.4%) was a major drawback to this study. The questionnaires were released and mailed to the sampled pharmacists according to their working hospitals’ addresses. Because the sampled pharmacists were not requested to fill out their identification in the returned questionnaires, we called the hospital pharmacies that employed the sampled pharmacists in this study to encourage the sampled pharmacists to respond to our survey. As a result, we lacked information regarding who the nonresponding pharmacists were, and this presented a limitation in this study for nonresponse analyses, even though there were no differences in the respondents’ gender, age, working hospital accreditation, or geographic distribution from the study population (see Table 2). More efforts could be made in the future to recruit more responses from the mailed surveys.

**Managerial Implications**

Our study should raise concerns on professional pharmacists’ quality of life within the workplace setting. Curiously, few studies have deterred hospital executives from being concerned on the quality of life in the work setting for hospital pharmacists. The findings reveal and provide insights on the effects of servicescapes for architect designers, interior designers, and administrators, bolstering the notion that a well-designed health
care facility can improve the working lives of facility employees. In this study, from the physical environment perspective, for example, we found that noises from drug-related equipment in the dispensing areas, including inpatient, outpatient, and emergency areas, of hospital pharmacies were ranked as the three least satisfied items among all components of the possible physical environment, on average. Abel (1990) reviewed research on the extra-auditory effects of exposure to noise and showed that high levels of noise are particularly disruptive for dual-task paradigms, requiring attention sharing and sequential responding, involving speed and accuracy. Also, both the level and type of the noise background affect memory, severely limiting the number of stimulus dimensions that may be simultaneously encoded and retained. Furthermore, noise also causes annoyance, including its own by-products, such as job dissatisfaction, irritability, and anxiety over potential risk. We urge hospital administrators to refocus the issue of noises occurring in hospital pharmacies to provide some possible muffling or insulation to reduce the noise effects of running such drug-related equipment. Perhaps pharmaceutical engineers could extend their efforts into this realm in the future by designing user-friendly equipment for professional pharmacist users, especially in light of noise issues that affect this setting and the employees working in it.

With a score of 3 as moderate perceptions of satisfaction with the physical environments of hospital pharmacies, what were also revealed included several items that ranked below the neutral perceptions. What also warrants further notice is that all surveyed items of physical environments of hospital pharmacies were not ranked high by the hospital pharmacists; none of the items were ranked, on average, beyond a score of 4 as satisfied. We further examined the frequency percentages recoded as category scales such as less dissatisfied, moderate, and most satisfied. Because it is possible that extremely ranked values (dissatisfied vs. satisfied) by equal percentages of respondents might lead to a moderate score, on average, this might lead to an incorrect explanation regarding these surveyed items as moderate perceptions, and the extreme values (i.e., less satisfied) would likewise be ignored or not managed. This phenomenon can be seen, for example, in the dimension of outpatient dispensing areas in this study. The respondents ranked the space design of the dispensing counter, the functional design of the dispensing counter, and the noise generated from the drug-related equipment below the neutral score of 3, on average. However, among moderate perceptions of other satisfaction items, we found that 35% of the respondents ranked air conditioning temperature as dissatisfied, though the average (3.07) was not low (data not shown). Furthermore, we anticipate that more issues could be addressed in the future with respect to the space and function design of dispensing areas, the interior designs of storage areas, and the space design of the administrative offices of hospital pharmacies, which are the items not ranked as high perceptions by hospital pharmacists through the assistance of architects and interior design professionals.

Male pharmacists were found to have higher perceived satisfaction than female pharmacists with respect to the physical environment in this study.

Table 4

Standardized parameter estimates of the structural equation model for the effect of physical environments on hospital pharmacists’ work outcomes

<table>
<thead>
<tr>
<th>Determinants</th>
<th>PHY SAT LEA RED STR</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHY</td>
<td>– 0.49*** –0.29*** –0.29*** –0.10</td>
</tr>
<tr>
<td>Confounding factors</td>
<td></td>
</tr>
<tr>
<td>AGE</td>
<td>0.15 0.13 –0.15 –0.12 0.15</td>
</tr>
<tr>
<td>GENDER (1 = male; 0 = female)</td>
<td>0.22** 0.02 0.08 0.13 –0.03</td>
</tr>
<tr>
<td>WORKH</td>
<td>0.01 0.03 0.02 0.04 0.10</td>
</tr>
<tr>
<td>R²</td>
<td>0.08 0.29 0.11 0.10 0.03</td>
</tr>
</tbody>
</table>

Note. Overall model fit: $\chi^2 = 32.55, df = 43 \ (p = .88), \chi^2/df = 0.76, NFI = 0.97, CFI = 1.00, RMSEA = .00, P_CLOSE = 1.00$, Hoelter's critical $N = 330 \ (0.05$ level). PHY = second-order latent variable, physical environments of hospital pharmacy; AGE = age; GENDER = gender; WORKH = work years in surveyed pharmacy; SAT = job satisfaction; LEA = leaving intension; RED = intension to reduce working hours; STR = job stress.

*p < .05.

**p < .01.

***p < .001.
Sundman-Digert (2004) assessed the extent of indoor air problems in office environments in Finland. The complaints and work-related symptoms associated with indoor air problems were common in office workers, and women reported indoor air problems and work-related symptoms more often than men. Bakke, Moen, Wieslander, and Norbäck (2007) investigated 173 staff members in four university buildings and concluded that gender, psychosocial, and physical environment factors were related to symptoms and perceived indoor climate. As such, further research should be conducted to better understand how health professionals and employees perceive and work in the workplace by integrating personal variables to mediate the impact of environmental stress on health, such as intrinsic sensitivity to specific hazards, personality, restricted capacities, other stress, culture, personal preferences, stages of life, gender, and perceived social support (Topf, 2000), thereby helping to improve this dynamic and fast-paced work environment.

Acknowledgment

Many thanks are given to China Medical University for grant support (CMU93-HSM-01).

References


