

UNIVERSITY OUTDOOR SPATIAL LAYOUT EFFECT ON PERCEPTION OF STUDENTS' INTERACTION AND GROUP SECLUSION

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A student grouping is affected by the space boundaries that it occupies in educational settings. Enclosure of space affects in-group interactions and seclusion. The hypothesis of the present study is that students' social interaction within the group is affected by increasing spatial enclosure, and seclusion is affected by exposure to increasing pedestrian flow in outdoor spaces on university campuses. The reported study included visual manipulations of two natural zones in an open courtyard at the Jordan University of Science and Technology Campus in the city of Irbid, Jordan. Analysis of the variance showed that perception of seclusion decreased when pedestrian flow took place and increased when spatial enclosure occurred, whereas perception of interaction increased with increasing pedestrian flow compared to that of spatial enclosure occurrence. Vitality was affected by the location of the individual subjects. Implications suggest that a closer look at public outdoor spatial layouts should take place in terms of locating functions that affect pedestrian flow such as kiosks and enclosure formation in settings where healthy social interactions and friendship formation are of concern, such as in educational institutions.

INTRODUCTION

When individuals self-select themselves into groups, they can attain the privacy and seclusion they need, and they can attain satisfying levels of group interaction. Individuals selectively control who is welcomed into, and who is kept out of, their group in order to regulate group interaction (Altman, 1975, 1976; Altman and Chemers, 1980). Group members regulate their interactions through privacy regulation mechanisms such as verbal and paraverbal behavior (i.e., tone of voice), personal space, territorial behavior, and by evoking culturally appropriate norms of interaction regulation (e.g., standards of politeness, appropriate patterns of gaze and eye contact, norms and standards for greeting and leave-taking). Often members will seek out and use particular physical spaces and places in order to achieve the blend of seclusion and interaction they desire (Altman, 1975, 1976; Altman and Chemers, 1980).

Open spaces are usually perceived as areas for recreation and interaction (Unger and Wandersman, 1985). Sociable spaces attract more individuals than less sociable spaces (Whyte, 1980). When individuals are alone, they tend to go to a lively place; individuals are attracted by the presence of other people in public spaces (Whyte, 1980). Self-selected groups need boundaries in open spaces in order to increase their seclusion, creating an enclosure that promotes this psychological comfort (Hall, 1976; Lang, 1987). Outdoor space enclosure can be formed by the floor and by the surrounding architectural surfaces (e.g., walls and buildings).

The present study focuses on the analysis of outdoor-spatial layout components that might influence interaction, seclusion, and vitality in academic settings, such as university campuses. The study examines the effect of both space enclosure and exposure to pedestrian flow on the perception of students' interaction and seclusion within the self-selected group. Interaction and seclusion in public open spaces promotes bonding and group integrity, which promotes students' attachment to their campus and increases their sense of belonging to their institution.

Usually, students of Jordan University of Science and Technology (JUST) group and interact in the open courtyards of the campus. The total number of students on the JUST campus is 11,321, with 10,711 undergraduates of which 6,238 are male and 4,473 are female. The majors of study include engineering, computer and information technology, applied medical sciences, dentistry, pharmacy, nursing, science and arts, agriculture, and veterinary medicine.

The campus courtyards have different rhythms of use and interaction and are related to the students' schedules. Courtyard use is lively on a nice, sunny day, especially around lunchtime when it reaches its peak. So, the number of students in these open spaces vary according to the time of the day, the weather, and the court location. Students who have prior familiarity with each other cluster themselves as groups to interact in these spaces. Their interaction seems to be in self-selected, secluded group patterns on the one hand, and people-watching groups on the other hand. People-watching groups mostly form at the edge of a pedestrian traffic route. Some groups are active and lively; others are quiet and relaxed. The most distinctive court in terms of liveliness and crowds of students is the C-courtyard. Students cluster in groups in this specific courtyard and in two zones: one zone is close to the staff cafeteria, and the other zone is close to the major corridor that leads to the students' cafeteria. Students in this outdoor space interact together in groups and with different degrees of privacy. The major characteristic of the C-court is its enclosure by the walls of the major building and its exposure to pedestrian flow. These two characteristics were manipulated to test whether students generally believe enclosed courtyards exposed to pedestrian flow support controlled effect on individuals' judgments on interaction and seclusion, whether the location is busy or quiet.

BACKGROUND

Group Interaction

Self-selected group members may affect their group member's values or norms through interaction, whether that is facilitated by language or by signs (Rapoport, 1982; Unger and Wandersman, 1985). Affective bonds are promoted through interactions; members develop psychological feelings of membership and belonging (Glynn, 1981; Keller, 1987; Stokols and Altman, 1987; Flanagan, 1990). Attachment is a positive bond between individuals and their environment, as well as a multi-dimensional bond of social interaction. Attachment refers to commitment of members to their group and place (Fischer, 1977, 1984). Once members establish attachment to their group or place, they will feel more secure (Stokols and Altman, 1987). Attachment to place is motivated by individuals' desires for interaction, seclusion, and affiliation with similar individuals (Fischer, 1977; Stokols and Altman, 1987; Unger and Wandersman, 1985).

Seclusion

Seclusion involves separation of members of the self-selected group from its milieu and is a state of privacy that is affected by the physical setting (Westin, 1970; Altman, 1975; Hall, 1976). When the setting enables private communication, group members confide in and interact with each other (Westin, 1970). The need for seclusion in a space is allied with the need for privacy, in that specific space, which is necessary in order to regulate the flow of information (Moore, 1979). Spatial enclosure increases privacy and promotes members' seclusion (Al-Homoud and Tassinari, 1997). Personal space can be described in terms of the spatial zones: intimate, personal, social, and public zones. Personal zones open opportunities for detailed communication channels, in which distance becomes crucial. Personal space is used in private spaces and in public spaces (Altman, 1975; Hall, 1976; Westin, 1970).

Space Enclosure

People seek out and manipulate space to regulate their contact with others (Stokols and Altman, 1987). The architectural variables that affect the perception of open and enclosed space include the organization and the characteristics of vertical elements (Hayward and Franklin, 1974). The relationship between space size and enclosure is not crucial; rather, surfaces and boundary definitions are more important for enclosure definition (Theil, *et al.*, 1986). These are defined as the space-establishing three elements (SEE) and include objects, screens, and surfaces occurring in various combinations. Surfaces include front, left, right, overhead, and under. The absence of the three elements is the least perceived enclosure, and the presence of surfaces from all sides of the space is the most perceived enclosure. Enclosure is defined by the degree of explicitness and the relative proportion of the SEE components (Stea and Downs, 1970; Theil, *et al.*, 1986). Therefore, side and overhead surfaces form what is considered an intermediate enclosure.

Spaces can be designed to encourage interaction or seclusion. For example, designs that encourage interaction include paths, and designs that discourage interaction include enclosed walls (Gibson, 1977; Lang, 1987). The greatest degree of seclusion is afforded by a complete enclosure (complete privacy). However, it is important to differentiate between barriers and screens that form enclosures. The former limits access but not visual penetration and, therefore, seclusion, while the latter may provide access and visual penetration depending on the substance of the surfaces and, therefore, promotes interaction (Gibson, 1977; Lang, 1987). Space enclosure potentially influences the need for privacy, and it functions as a buffer, providing physical and psychological protection against intruders (Dillman and Dillman, 1987). In the case of social interaction, group members behave as if spatial zones and boundaries surround them (Unger and Wandersman, 1985).

Intervening Relationships

Men's and women's perceptions of space enclosure are similar, though they prefer privacy differently in public places (Altman, 1975; Altman and Chemers, 1980; Theil, *et al.*, 1986; Pederson and Topham, 1990). In public spaces, women are more sensitive to where they will sit; men tend to sit by the edge, and women tend to seclude themselves in public spaces (Whyte, 1980). Personal space requirements vary with gender; males use more personal space than females (Stokols and Altman, 1987). On the other hand, symbolic interaction changes in meaning with gender (Stryker, 1987; Tannen and Wallat, 1987). Familiarity with space affects peoples' sense of space and their experience of space (Pyron, 1971). Consequently, participants' gender and amount of familiarity with space in the present study will be assessed to see if they make a difference in terms of how participants judge spaces.

FIGURE 1. View of the C-courtyard at Jordan University of Science and Technology. Zone 1 is located at the right end of the left facade. Zone 2 is located at the left end of the right facade.

In the present study, spatial layout may afford students' interaction and group seclusion; space enclosure might afford seclusion; and pedestrian flow might afford invitation and openness and, therefore, casual interaction. In this context, the research dependent variable, *interaction*, can be constrained or influenced by the outcome of the exchange through the influence of the independent variable, *space enclosure*; and the research dependent variable, *seclusion*, can be constrained or influenced by the outcome of the exchange through the influence of the independent variable, *pedestrian flow occurrence*, which is represented by the presence of kiosks.

Research Hypothesis

According to the previous literature and the above suggestions, this research assumed the following hypothesis to be tested: for outdoor spaces on a university campus, increasing perception of spatial enclosure and quietness will increase the perception of seclusion, and increasing perception of pedestrian flow will increase the perception of social interaction.

METHOD

The research method included a structured questionnaire, which was administered in the context of face-to-face structured and formal interviews. The setting of the interview was the preselected two zones in the preselected C-courtyard at Jordan University of Science and Technology, Irbid, Jordan (Figure 1).

Subjects

The study population was the students at Jordan University of Science and Technology (JUST). The sample consisted of 180 undergraduate students selected randomly from clusters of self-selected groups at the C-courtyard of JUST. Randomization was stratified for gender; half of the subjects (90) were males and the other half (90) were females. Participation of the subjects in the study was voluntary.

Settings

Two outdoor zones (Zone 1 and Zone 2) in one of the university courtyards (C-court), where students usually gather in groups, were selected as the settings of the study. The C-court is well known for attracting a large number of students of all majors to gather during the day, depending on the weather. It is the most active courtyard on the whole campus. The courtyard is divided into two levels, upper and lower. The upper level was selected because it attracts more students, is adjacent to a major pedestrian flow, and is adjacent to the walls of the buildings that form the enclosure of the courtyard. It is divided into two zones. Zone 1 is an outdoor space enclosure defined by plant boxes that can be used for sitting and is connected visually to a busy spine of circulation that leads to the student cafeteria and is, therefore, considered a busy zone. Zone 2 is an outdoor space enclosure defined by plant boxes that can be used for sitting and is connected to a less busy corridor that passes by the staff cafeteria and, therefore, is considered a quiet zone (Figure 1).

Apparatus

Face-to-face interviews were conducted at the above described two selected zones. The instrument, which was developed by applying factor analysis to the initial scale, was used to collect information about perception of individual interaction and privacy within the group. Informed consent forms and multi-media questionnaires were included. The written material used to collect the data related to dependent and independent variables. Two colored 7 x 5 inch manipulated photographs with alteration to the original environment for each of the two selected zones were shown to the subjects in order to elicit data related to dependent and independent variables.

Stimuli. The two manipulated original images were architecturally redrawn from reality and were produced using computer software (Auto Cad and 3-D Studio), layouts B and C. The existing situation, which was then to be used as layout A in the study, is shown in Figure 2. Layout B was a manipulation of Layout A to represent intermediate enclosure, using hypothetical vertical and overhead surfaces in each of the two zones (Figure 3). Layout C was a manipulation for Layout A to represent pedestrian flow occurrence using a hypothetical kiosk in each of the two zones (Figure 4). A pilot study that has been conducted by a small group of judges indicated that kiosks attract pedestrian flow because they are a major source of information for students. It is the case on this campus that kiosks are sources for pedestrian flow and vitality. Each of the three layouts (A, B, and C) in both Zone 1 (the busy zone) and Zone 2 (the quiet zone), was photographed after being fully rendered with colors by the computer software 3-D Studio. The experimenters then presented the colored prints (7 x 5 inches) to the individual subjects in the sample. The stimuli was used to measure the two independent variables: "space enclosure" through the manipulated vertical and overhead surfaces, and "pedestrian flow" through the manipulated kiosk.

Dependent Measures

Group interaction, seclusion, and vitality were measured using a 5-point scale: (1) measures the lowest socio-spatial perception; (5) measures the highest socio-spatial perception of the place. The initial scale consisted of 21 statements in Arabic describing how group members perceive socio-spatial aspects of the place under study (see Appendix I). The content of those statements was derived from previous studies and similar scales in Arabic literature (Zahran, 1977).

The initial scale was given to students at JUST who were not included in the sample of the main study. The responses were analyzed using factor analysis (Orthogonal Transformation Solution-Varimax). The analysis revealed statements that measure individual interaction within the group, individual seclusion within the group, and individual vitality within the group. Statements that loaded above 0.50 were used. Eight statements were chosen for group interaction that define perception of place in terms of discussion, talking, and communication with the group, the loading of which ranged from 0.557 to 0.793. Six statements were chosen for group seclusion that define perception of place in terms of protection from surveillance, support of autonomy and privacy, and relaxation and non-

FIGURE 2A. Zone 1.

FIGURE 2B. Zone 2.

FIGURES 2A-B. Perspectives of the existing situation for the selected setting, layout "A" of the study.

FIGURE 3A. Zone 1.

FIGURE 3B. Zone 2.

FIGURES 3A-B. Perspectives of the manipulated intermediate enclosure, layout "B" of the study.

FIGURE 4A. Zone 1.

FIGURE 4B. Zone 2.

FIGURES 4A-B. Perspectives of the manipulated pedestrian flow occurrence (kiosk allocation), layout "C" of the study.

TABLE 1. Means and standard deviations for scores of interaction in spatial layouts (A, B, and C) for the two zones.

Factor	Count	Mean	Standard Deviation	Standard Error
Layout A:				
Interaction	60	3.039	1.042	.135
Seclusion	60	3.509	.846	.109
Vitality	60	3.389	.937	.121
Layout B:				
Interaction	60	3.414	1.001	.129
Seclusion	60	3.939	.796	.103
Vitality	60	3.084	.830	.107
Layout C:				
Interaction	60	3.556	.699	.090
Seclusion	60	2.583	.613	.079
Vitality	60	4.028	.799	.103

crowdedness, the loading of which ranged from 0.513 to 0.811. Four statements were chosen for group vitality, the loading of which ranged from 0.528 to 0.813. The statements of group vitality defined the perception of place in terms of promoting a sense of cheerfulness, a sense of activity, and a sense of energy. To ensure the reliability of the statements, the Reliability Coefficient was used to test for internal consistency for each factor as a sub-scale. Alpha values for group interaction (.90), group privacy (.84), and group vitality (.80) were acceptable. The statements were transformed into continuous variables using the hypothetical average for the above assigned set of statements to the specified variable. The hypothetical average was calculated by the sum of the responses of the assigned statements over the number of assigned statements for the specified variable. Potential confounding variables included past familiarity with the place and gender.

Procedure

The study included six conditions in a two (interviews occurred in busy Zone 1 or quiet Zone 2) by three (plaza design: original; intermediate enclosure; pedestrian flow depictions) design. Six trained assistants were separately assigned to each of the six conditions. The experimenters randomly chose 90 students from Zone 1 and 90 students from Zone 2. Up to thirty randomly selected subjects were assigned for each assistant to represent each of the three situations in each zone over a two-month time period. After being randomly selected, subjects who agreed to participate filled out a consent form, then the questionnaire, and then they were thanked and debriefed. Subjects were shown one layout using manipulated images of the specific zone where the subject was located. Subjects were asked to imagine themselves in the place of the human figure in the specific image when rating perception for group interaction, seclusion, and vitality.

RESULTS AND DISCUSSION

To assess the hypothesis that spatial enclosure and pedestrian flow affect students' interaction and their seclusion and vitality in university outdoor space, analyses of variance were conducted and are reported as follows:

Familiarity and Gender

Two-way analysis of variance (ANOVA) was used to test for the statistical differences in perception of students' interaction, seclusion, and vitality, due to the effect of familiarity and gender. Main effects for familiarity and gender were non-significant (all $F < 1$), so subsequent tests collapsed across these variables.

TABLE 2. Results of ANOVA for scores of interaction in layouts (A, B, and C) for the two zones.

Type III Sums of Squares					
Source	df	Sum of Squares	Mean Square	F-Value	P-Value
ZONE	1	.001	.001	.001	.9706
LAYOUT	2	8.566	4.283	5.952	.0032
ZONE * LAYOUT	2	26.840	13.420	18.649	.0001
RESIDUAL	174	125.207	.720		

Dependent: INTERACTION

TABLE 3. Results of ANOVA for scores of seclusion in layouts (A, B, and C) for the two zones.

Type III Sums of Squares					
Source	df	Sum of Squares	Mean Square	F-Value	P-Value
ZONE	1	.012	.012	.020	.8871
LAYOUT	2	57.643	28.821	50.550	.0001
ZONE * LAYOUT	2	2.456	1.228	2.154	.1191
RESIDUAL	174	99.208	.570		

Dependent: INTIMACY

Interaction

To test for the effect of spatial layout on perception of interaction, mean scores for Factor 1 were subjected to two-way analysis of variance (ANOVA), as shown in Tables 2 and 3.

Mean scores in Table 1 show that the original layout (A) has the lowest perceived interaction score ($M = 3.039$) of the three alternative layouts, and the pedestrian traffic layout (C) has the highest ($M = 3.556$). The test for statistical differences in Table 2 demonstrates a main effect for spatial layout on scores of perceived interaction $\{F(2, 174) = 5.952, p < 0.0032\}$. A post hoc comparison (Scheffe's S , $p < 0.05$) shows less interaction is perceived for the original layout (A) than the pedestrian flow layout (C) ($p = 0.045$), and less interaction is perceived for the original layout (A) than the intermediate enclosure layout (B) ($p = 0.056$). The statistical significance test in Table 2 shows no main effect for the independent variable (Zone) on perceived interaction ($P = 0.9706$).

Perceived interaction increased positively and significantly when pedestrian flow did occur (layout C), regardless of the quietness of the location of the individual judges. On the other hand, perceived interaction does not seem to be responsive to the existence of intermediate enclosure (layout B). Altman and Chemers (1980) and Taylor (1988) indicated that boundaries increase territorial control and, therefore, regulate interaction with others. Boundaries such as the ones used in the intermediate enclosure layout (B) were judged to promote interaction but do not necessarily guarantee high levels of interaction. The issue might seem critical in this study because group interaction in university open spaces opposes seclusion, which is usually promoted through enclosures. It seems that perceived interaction is more affected by pedestrian flow and it increases chances of passive contacts and casual encounters (Festinger, *et al.*, 1950; Unger and Wandersman, 1985; Marcus and Sarkissian, 1986).

TABLE 4. Results of ANOVA for scores of vitality in layouts (A, B, and C) for the two zones.

Type III Sums of Squares					
Source	df	Sum of Squares	Mean Square	F-Value	P-Value
ZONE	1	5.000	5.000	7.535	.0067
LAYOUT	2	27.845	13.923	20.982	.0001
ZONE * LAYOUT	2	9.730	4.865	7.331	.0009
RESIDUAL	174	115.459	.664		

Dependent: VITALITY

TABLE 5. Means and standard deviations for scores of vitality in layouts (A, B, and C) for the two zones.

Factor	Count	Mean	Standard Deviation	Standard Error
Zone 1:				
Layout A	30	3.209	1.026	.187
Layout B	30	2.639	.857	.156
Layout C	30	4.152	.858	.157
Zone 2:				
Layout A	30	3.569	.816	.149
Layout B	30	3.528	.509	.093
Layout C	30	3.903	.730	.133

Seclusion

To test for the effect of spatial layout on perceived seclusion, mean scores for Factor 2 were subject to two-way analysis of variance (ANOVA), as shown in Tables 1 and 3. Mean scores in Table 1 show that the kiosk occurrence layout (C) has the lowest perceived seclusion score ($M = 2.583$) of the three alternative layouts, and that the intermediate enclosure layout (B) has the highest ($M = 3.939$). The test for statistical differences in Table 3 demonstrates a main effect for spatial layout on scores of perceived seclusion $\{F(2, 174) = 50.55, p < 0.0001\}$. A post hoc comparison (Scheffe's $S, p < 0.05$) shows less seclusion is perceived for the original layout (A) than the intermediate enclosure layout (B) ($p = 0.0087$), and more seclusion is perceived for the original layout (A) than the pedestrian traffic layout (C) ($p = 0.0001$). The statistical significance test in Table 3 shows no main effect for the independent variable (Zone) on seclusion ($P = 0.8871$).

Perceived seclusion decreased significantly when pedestrian traffic occurred (layout C) (Table 3), regardless of the quietness of the location of the individual judges. This is possible because extensive proximity of people interferes with perception of seclusion (Marcus and Sarkissian, 1986). Exposure to pedestrian flow presents proximity of people in space and, therefore, diminishes privacy and seclusion. On the other hand, perception of seclusion seems to be responsive to enclosure (layout B), since it provides privacy. Dillman and Dillman (1987) and Al-Homoud and Tassinary (1997) indicated that space enclosure increases seclusion; as a state of privacy, seclusion needs security and sense of control. In addition, boundaries, which enhance enclosure, regulate privacy (Altman and Chemers, 1980), suggesting that enclosures be interconnected with privacy perception.

Vitality

To test for the effect of spatial layout on perceived vitality, mean scores for Factor 3 were subject to two-way analysis of variance (ANOVA), as shown in Tables 1 and 4.

Mean scores in Table 1 show that the kiosk occurrence layout (C) has the highest vitality score ($M = 4.028$) of the three alternative layouts, and layout B has the lowest ($M = 3.084$). The test for statistical differences in Table 4 demonstrates a main effect for spatial layout on scores of perceived vitality $\{F(2, 174) = 20.982, p < 0.0001\}$. A post hoc comparison (Scheffe's S, $p < 0.05$) shows that less vitality is perceived for the original layout (A) than for the pedestrian flow layout (C) ($p = 0.002$), and no significant difference is perceived between the original layout (A) and the intermediate enclosure layout (B) ($p = 0.1246$). The ANOVA in Table 5 also shows that participants in busier Zone 1 rated the photos as having less vitality than participants in calmer Zone 2 $\{M = 3.333$ vs. $3.667; F(1, 174) = 7.535, p < 0.0067\}$ (Table 4). An interaction effect between the variables' spatial layout and zone was found significant $\{F(2, 174) = 7.331, p < 0.0009\}$. In the busy zone, vitality is perceived the highest by the individual judges when pedestrian flow occurred ($M = 4.152$) and the lowest when intermediate enclosure occurred ($M = 2.639$) (Table 5).

Perception of vitality increased positively and significantly when pedestrian traffic occurred in both the busy and the quiet zones, but it stayed higher in the quiet zone than in the busy zone. The above outcome suggests that vitality judgments are more sensitive to the location of the individual judges in the outdoor space than are judgments of interaction and seclusion. The suggestion here is that pedestrian flow in the busy zone has a greater effect on perceived vitality than that in the calmer zone. Overall, however, the perceived vitality of the busy zone was lower than that of the quiet zone. Zone 1, the busy zone, is adjacent to the main students' cafeteria, which is more familiar to students than Zone 2, the quiet zone, which is adjacent to the staff cafeteria. Finally, perceived vitality, as a concept, is much affected by the perception of spatial layout, especially in the sense of what creates an image of cheerfulness, activity, and dynamism (vitality). Pedestrian flow in this situation is represented by the kiosk, which is a dynamic state of spatial layout and seems to promote vitality more than space enclosure, which is a static state of spatial layout.

CONCLUSIONS

Strong Relationships. Perceived vitality is affected by the location of the judges, busy or quiet. Designs that provide functions that attract pedestrian flow are perceived as places that support interaction and vitality and discourage seclusion. On the other hand, people feel more private when they have enclosure and when seclusion becomes more available. It controls where, when, how, and with whom interaction takes place. Moreover, ratings of group vitality were sensitive to the location of the raters. Raters in busier Zone 1, which is adjacent to the major access of the students' public cafeteria, saw less vitality in the experimental designs than raters in less busy Zone 2, which was adjacent to the staff cafeteria.

Weak Relationships. Perceived interaction and seclusion are not affected by the location of the judges, busy or quiet. Space enclosure does not affect perceived interaction, but it does enhance ratings of perceived seclusion. Physical barriers regulate the opportunity to interact as Altman and Chemers (1980) stated but do not necessarily guarantee interaction. In this study we used intermediate space enclosures, which were represented by semi-transparent architectural surfaces (side and overhead). On the other hand, ratings of perceived vitality were negatively affected by space enclosure. Perceived vitality is promoted by a sense of openness and accessibility to others and the surrounding. This explains why vitality was affected positively by pedestrian traffic occurrence and negatively by space enclosure. Surprisingly, gender did not show any difference in judging interaction, seclusion, and privacy, though culturally the two genders deal with these behaviors differently. This unexpected result is probably due to the fact that current generations behave differently and are exposed to other cultures, and, therefore, their behaviors are shifting away from the traditional norms.

IMPLICATIONS

In order to increase opportunities for both seclusion and interaction within the group in educational settings in Jordan, and specifically in outdoor spaces, a closer look should be given to the spatial layouts in terms of their location, their pedestrian flow occurrence, and their layers of enclosure. Specifically, understanding the socio-spatial aspects of the C-court at JUST would help us to understand the phenomena of this space being the busiest outdoor space on the whole campus. It would also help designers and landscapers to improve the environmental quality of this specific space by stressing the positive aspects of its design and suppressing the negative impacts of its design. Moreover, the findings suggest that the most influential component of spatial layout is the kiosk, which represents a pedestrian flow. Therefore, there is a present proposal of distributing small kiosks on campus in order to activate university outdoor spaces. Understanding the socio-spatial impact of kiosks would help the university administration to make a decision and to take action, if group interaction is desired.

Suitable design structures in open spaces support group boundaries, which in turn encourage friendship formation. Making boundaries and enclosures to support group seclusion strengthens and secures group membership and bonding and, therefore, attachment to campuses in Jordan. The present study was geographically limited to Jordan University of Science and Technology, a campus of about 11,000 students in the city of Irbid, Jordan. More quasi-experimental research needs to be carried out at other campuses in Jordan in order to assess the relationship between spatial layout and interaction and vitality of groups of students.

APPENDIX

APPENDIX A. The 21 items of the initial scale with their loading on each factor, after being analyzed using Factor Analysis.

Items Describing the Environment as:	Factor 1 Interaction	Factor 2 Seclusion	Factor 3 Vitality
1. Promoting the feeling of formality	-.102	-.088	-.813
2. Encouraging group discussions	.557	-.054	.336
3. Promoting the feeling of happiness and smiling	.163	.048	.713
4. Encouraging the exchange of help and support *	.427	-.219	.461
5. Encouraging individuation *	-.430	.282	-.306
6. Encouraging group cohesion	.729	-.107	.116
7. Encouraging listening to what others say	.657	.159	-.102
8. Promoting the feeling of anxiety and being alert *	.149	.029	.064
9. Promoting the feeling of relaxation	.281	.593	-.101
10. Encouraging talking to others	.684	.117	.153
11. Promoting the feeling of peacefulness	.287	.513	-.528
12. Promoting the feeling of energy and action	.163	-.17	.789
13. Promoting the feeling of security *	.461	.393	-.162
14. Encouraging belonging to the group	.792	-.246	.089
15. Protection from other people's surveillance	-.137	.811	.121
16. Promoting the feeling of autonomy	-.080	.753	.111
17. Encouraging communication between group members	.793	.053	-.065
18. Encouraging communication with other groups	.583	.044	.226
19. Promoting the feeling of territoriality	-.582	.377	-.412
20. Promoting the feeling of crowding	.249	-.567	.133
21. Promoting the feeling of privacy	.016	.742	-.134

*This item was excluded in the final developed scale because it did not achieve a satisfactory loading on any of the three factors.

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