Review Article

Proxemic Behaviors in Same-Sex and Opposite-Sex Social Interactions: Implications for Urban Public Spaces

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ABSTRACT

Proxemics is the study of human communication space, examining how individuals interact physically and the nature of these interactions. Edward T. Hall introduced the concept of proxemics and developed a notation system to record proxemic behaviors, showing how cultural principles define intimate, personal, social, and public zones based on mental, visual, auditory, olfactory, thermal, and tactile experiences. While these concepts have been widely studied in various cultural contexts, ongoing changes in societal norms, technological developments, and global health events highlight the need for updated research that can inform the design of physical environments. This study examines proxemic behaviors among same-sex and opposite-sex individuals, focusing on the impact of eight factors: postural-sex identifiers, sociofugal-sociopetal axis, kinesthetic factors, tactile/touch code, visual code, thermal code, olfaction code, and voice loudness. Adopting a qualitative, comparative approach, the research involved video and photo analysis of student interactions in a controlled café environment. The interactions were segmented into three five-minute intervals to observe changes over time. Findings revealed that opposite-sex individuals maintained greater distances, reduced direct eye contact, and avoided facing each other directly compared to same-sex individuals, particularly during the initial minutes. These results highlight the importance of considering proxemic behaviors in designing urban and architectural spaces sensitive to cultural and social dynamics.

Introduction

The simplest element of human shared life is social action. Social action refers to the series of clear movements that a person performs toward another person to achieve a goal. People have an inherent need to establish social relations, which leads them to create situations where they can experience such interactions. Social relationships occur for different purposes: emotional purposes including friendship, kinship, and neighborhood relations; rational purposes aiming to maximize the chance of achieving a goal; value-based purposes pursuing a goal regardless of alternative options and their costs; traditional purposes based on traditions and beliefs, with endurance rooted in traditional and religious legitimacy [1].

The cultural system and social relationships are interconnected. On the one hand, culture is the product of social relations, with the intensity of these interactions influencing cultural values and norms. On the other hand, culture determines the conditions and modes of forming social relationships. Distances and sensory intensities play a reciprocal role. Intense emotional contacts usually happen at relatively close distances, up to half a meter, where all senses work together and allow full perception of details. Contacts with less emotional intensity occur at larger distances, around 0.5 to 0.7 meters. Social distance, suitable for daily conversations between friends, acquaintances, neighbors, and colleagues, ranges from 1.3 to 3.75 meters. The conscious use of distance applies to almost every situation of human contact [2].

Proxemics is the study of human communication spaces, analyzing how individuals interact physically with each other

and what those physical relations communicate. Edward T. Hall coined the term proxemics and developed a notation system for recording proxemic behaviors. Hall stated that cultural principles and norms define the intimate, personal, social, and public zones based on mental, visual, auditory, olfactory, thermal, and tactile experiences, while also being influenced by cultural backgrounds and psychological factors.

Hall argued that humans have modified proxemic rules compared to animals, reflecting their complex social relations. Unlike animals, which use scent to mark territory, humans use walls, fences, and other physical boundaries [3]. Hall observed that humans are governed by unwritten rules encouraging them to maintain personal space and to respect others' spaces, a concept supported by theory of mind [4].

Studying proxemic distances in different types of social interactions is crucial, because disregarding them when designing urban spaces can result in discomfort or disruption of social relationships [5].

Proxemic distances are generally categorized into four groups: intimate distance, personal distance, social distance, and public distance [6]. Recent research has emphasized the need for architectural structures to adapt dynamically to environmental and human factors [7]. Proxemic behaviors in Persian urban spaces have been previously studied by Salehi and Naghshineh and were further expanded during the COVID-19 pandemic [7,8]. Building on Edward Hall's foundational framework, additional criteria have been introduced for more precise analysis of social interactions, particularly within the intimate, personal, and social categories. Given that proxemic behaviors are deeply influenced by cultural contexts, the purpose of this study is to document proxemic behaviors in social interactions and to examine the similarities and differences between same-sex and opposite-sex interactions within a Persian cultural environment. Future research is recommended to explore cross-cultural comparisons with larger and more diverse sample populations.

Proxemic Behaviors

Proxemics is the study of how humans structure and manage space around themselves in interactions with others. It examines how people physically interact with others and what these physical relationships communicate [9].

Proxemic behaviors can be influenced by eight different factors, each with its own scale and measurement. Because understanding proxemic behavior is complex, it is simplified by recording these eight factors separately as follows: postural-sex identifiers, sociofugal-sociopetal axis, kinesthetic factors, tactile or touch code, visual code, thermal code, olfaction code, and voice loudness scale [10].

Postural-Sex Identifiers

This factor categorizes individuals based on gender and body posture, whether standing, sitting, or lying down (Figure 1). To quickly and easily document interpersonal relationships, coding their posture and gender combination is helpful. For instance, a man talking to a woman while both are standing would be coded as 56, while a woman speaking to a man would be coded as 65. If it is unclear which participant is more active in the interaction,

parentheses are used around the code. Whenever one person is notably more active, this coding method is recommended.

Figure 1: Different body postures categorized by gender; source: Hall, 1963.

Sociofugal-Sociopetal Axis

Osmond introduced the terms sociofugal and sociopetal to describe how physical orientation either encourages or discourages interaction. A sociofugal arrangement keeps people apart and suppresses communication, while a sociopetal arrangement brings people together and stimulates interaction [11]. This section scores the angle of shoulder orientation between two people, using a scale from 0 to 8.
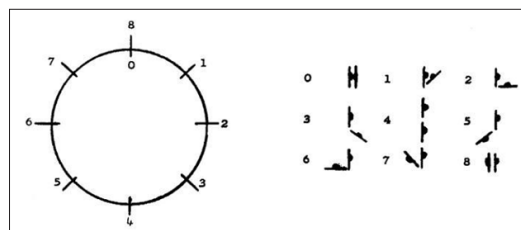

Figure 2: Coding the orientation of individuals toward each other; source: Hall, 1963.

Kinesthetic Factors

This factor relates to the physical closeness of one individual to another and the potential for touching or holding. Hall defined four basic methods of physical contact: touching with the head or trunk, touching with the forearm, touching with the elbow or knee, and touching with the fully extended arm or leg while leaning (when the distance is great but still allows for contact). These are coded as follows: 1.0 for body contact, 1.5 for slightly beyond body contact, 2.0 for forearm reach, 2.5 for slightly beyond forearm reach, 3.0 for extended arm reach, 3.5 for slightly beyond extended arm reach, 4.0 for maximum body extension, 4.5 for slightly beyond maximum extension [10].
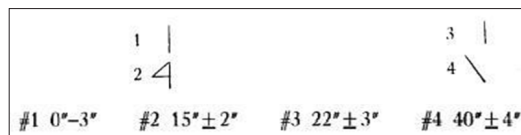
Figures 3 and 4: Different proximities and body orientations for interaction; source: Watson & Graves, 1966.
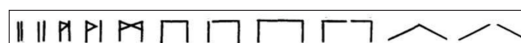
Figures 3 and 4: Different proximities and body orientations for interaction; source: Watson & Graves, 1966.

Tactile/Touch Code

Culture significantly affects the amount of physical contact between people. This section records the level of touch during interactions: 0 for holding and hugging, 1 for caressing, 2 for prolonged holding, 3 for holding/gripping, 4 for point contact, and 5 for incidental contact [12].

Visual Code

This section codes the degree and type of visual contact during interactions: foveal (direct focus on the eyes), macular (focus on the head and face), peripheral (glances toward the partner), and no visual contact (looking downward or staring elsewhere) [10].

Figure 5: Coding types of visual contact between individuals; source: Hall, 1963.

Thermal Code

The perception of another person's body warmth can influence proximity behaviors. Measuring this is difficult through observation alone; it usually requires thermal sensors or direct questioning of participants about their experience [12].

Olfaction Code

This section examines whether a person can detect another's body scent. Like the thermal code, direct observation is insufficient; participants must be asked whether they sensed any odor [10].

Voice Loudness Scale

Voice loudness is culturally influenced. This section measures the volume of an individual's voice during interaction, using sound analysis equipment. The categories are: 0 for very loud, 1 for loud, 2 for louder than normal, 3 for normal, 4 for quiet, 5 for very quiet, and 6 for silent [12].

Research Method
Selection of Participants

Initially, the city of Tehran was chosen for conducting the experiment, and participants were selected from among Tehran residents. The subjects were between 20 and 30 years old, either university students or recent graduates, and had not met each other before the experiment. A total of twelve participants were selected based on these criteria: ten women and ten men. They were paired in groups of two to engage in conversations within a designated space and for a limited time. Initially, same-sex pairs were formed for conversations and tested accordingly.

Subsequently, opposite-sex pairs were formed, and they too engaged in conversations and were tested (Charts 1 and 2).
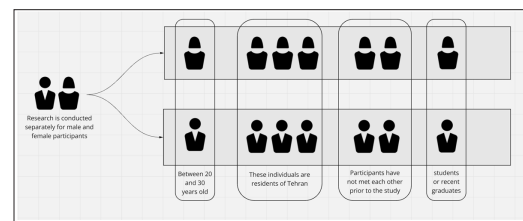

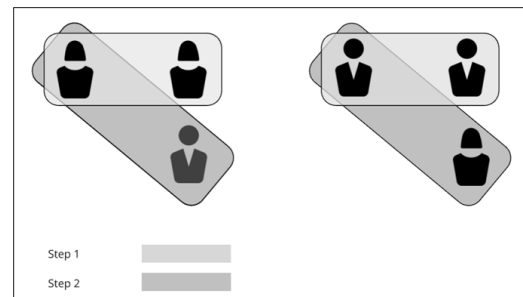**Chart 1:** Factors influencing participant selection; source: author.

Chart 2: Stages of conducting the experiment based on different gender pairings; source: author.

Environment Selection and Arrangement

As previously mentioned, a café was selected to host the face-to-face meetings of the student participants. The café needed to have a mezzanine floor to allow for overhead filming and photography to capture data accurately. Thus, the participants sat on the ground floor according to a predetermined layout (Figures 7 and 8), while researchers positioned cameras on the mezzanine floor to record the events.

The Previs Pro software was used to storyboard and create an approximate model of the environment, set up the layout, arrange the positions of cameras and lights, and predict participant behavior.
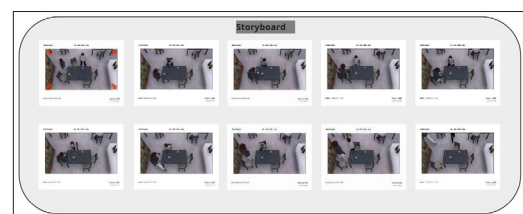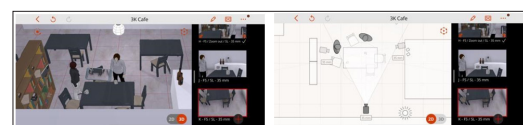

Figure 6: Environment layout modeled with Previs Pro; source: author.

Figures 7 and 8: Placement of cameras, light sources, and furniture; source: author.

Before the main experiments, a pilot study was conducted to test camera positions and predict unforeseen issues. After the pilot, minor adjustments were made to camera locations and recording

equipment to eliminate blind spots and improve sound capture quality.

A four-person table was used to give participants more freedom in choosing their seats. The table dimensions were set at 80x80 cm, aligning with Edward Hall's standard for personal distance. Given that participants were unfamiliar with each other, this table size was considered appropriate. Participants were instructed to come to the designated café and engage in a two-person conversation. They were free to choose their seat, move their chairs, or rotate them as desired, but they had to remain at the table until the specified time elapsed.

Figures 9 and 10: Arrangement of tables and chairs for optimal recording from above; source: author.

Timing

Experiments were conducted after peak café hours to avoid excessive noise, ensuring that participants would not need to raise their voices or sit closer than necessary. Background music was softly played to prevent forced proximity. The sessions took place over three consecutive nights between 8 and 10 PM.

Each experimental conversation lasted 15 minutes, providing enough time to overcome initial anxiety and to observe natural interaction behaviors in same-sex and opposite-sex pairings. Participants were asked to engage in conversation during the entire 15-minute period.

Behavior Analysis in the Recorded Images

To analyze social behaviors and relationships, the recorded videos were divided into three equal time segments: the first 5 minutes, the second 5 minutes, and the third 5 minutes. It was expected that during the first 5 minutes, due to initial nervousness, participants would maintain greater physical distance, experience longer periods of silence, and engage more with external objects like mobile phones or menus. For this reason, participants were allowed to have their mobile phones with them to capture these early behaviors.

It was anticipated that interactions, especially among same-sex participants, would warm up during the second 5 minutes. By the third 5 minutes, conversations would either continue smoothly or participants would begin showing signs of fatigue or impatience, awaiting the session's conclusion. Opposite-sex participants were expected to experience more stress during the first 5 minutes and demonstrate less comfort compared to same-sex participants during the second and third 5-minute segments.
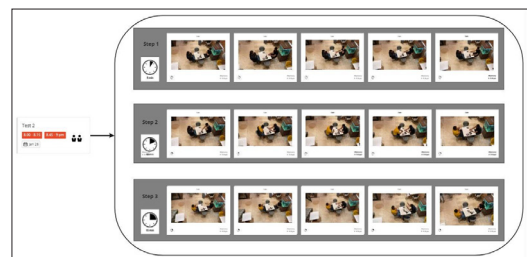
Edward Hall's proxemic criteria served as the main reference framework for analyzing the data, and each proxemic factor was separately examined.
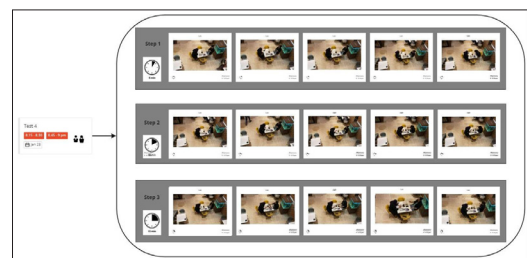

Figure 11: Sample of recorded images divided into three time periods; source: author.

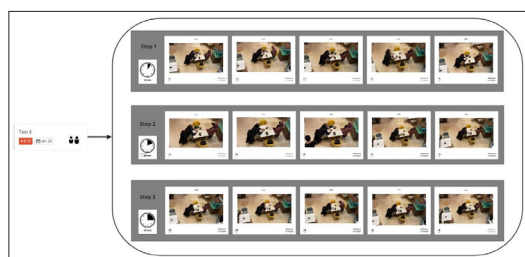**Charts 3:** Timing and categorization of photographic data; source: author.

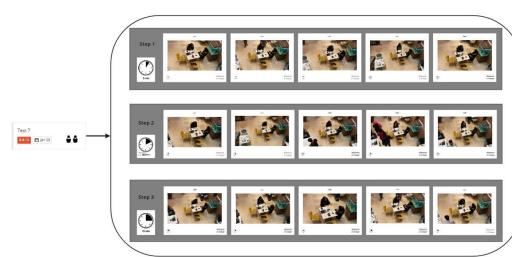**Charts 4:** Timing and categorization of photographic data; source: author.

Charts 5: Timing and categorization of photographic data; source: author.

Charts 6: Timing and categorization of photographic data; source: author.

Charts 7: Timing and categorization of photographic data; source: author.

Charts 8: Timing and categorization of photographic data; source: author.

Effective Factors on Proxemic Behaviors	Observed Situations in Layout	Predicted Situations and Behaviors Between Same-Sex Individuals	Predicted Situations and Behaviors Between Opposite-Sex Individuals
Postural / Gender	In the designed experiment, most individuals were seated.	Both individuals usually sat facing each other with a slight tilt.	At the beginning of the conversation, individuals sat with a tilt and avoided direct facing.
Social / Antisocial Orientation	In same-sex interactions, individuals tended to sit at a specific angle, mostly facing each other.	During same-sex conversations, individuals maintained more direct orientation toward each other.	Opposite-sex participants tended to sit at angles or avoid direct body orientation toward each other.
Kinetic / Movements Factors	Considering the table size (80×80 cm), the distance between participants was relatively constant (either touching or almost touching the table edges).	In same-sex interactions, the distance was slightly reduced during the conversation (closer physical proximity).	Opposite-sex individuals maintained greater distance throughout the conversation (e.g., 2.0 distance — forearm length or further).
Tactile/Touch Code	Due to the structure of the experiment, no physical touch was expected between participants.	In same-sex interactions, no intentional physical contact occurred (case 5: incidental contact).	In opposite-sex interactions, no intentional physical contact occurred.
Visual Code	According to video analysis, eye contact in same-sex interactions was either macular (M) or occasionally peripheral (P).	In same-sex conversations, visual contact was generally macular and occasionally peripheral.	In opposite-sex conversations, visual contact was mostly peripheral and less direct.
Thermal Code	Due to the size of the table, participants' perception of body warmth was minimal or nonexistent.	Participants did not report feeling each other's body warmth.	Participants did not report feeling each other's body warmth.
Olfaction Code	Due to the set distance, the perception of each other's scent was unlikely.	Participants did not report sensing the smell of others.	Participants did not report sensing the smell of others.
Voice Loudness	Using recording equipment, voice loudness was measured and remained relatively stable throughout the sessions.	Voice loudness remained stable across same-sex conversations.	Voice loudness remained stable across opposite-sex conversations.

Chart 9: Analysis of effective factors influencing proxemic behaviors in the experiment. Source: Author.

Results

In this study, the similarities and differences in proxemic relationships were analyzed, aiming to inform the design of interactive spaces where individuals of the same and opposite sex can comfortably engage. By refining spatial design based on proxemic data, we can create environments that enhance psychological comfort and better satisfy social needs.

To achieve precise comparisons, the photographic data were analyzed according to the time segments previously defined (5-minute intervals). Additionally, each of Edward Hall's identified proxemic factors was separately examined to identify patterns, similarities,

and differences and to understand their implications for architectural space design.

Social / Antisocial Orientation
After analyzing each photo frame based on the three 5-minute intervals, the participants' body orientations were studied.

In all three-time segments, same-sex participants tended to sit facing each other in parallel or direct alignment.

However, during interactions between opposite-sex participants, especially women, there was often a tendency to maintain an angled orientation rather than sitting directly across from the male participant. Male participants, whether interacting with same-sex or opposite-sex partners, generally maintained a direct facing orientation throughout the interaction.

Architectural Implications of Social/Antisocial Orientation
Based on the findings regarding social/antisocial orientation, it is recommended that interior design consider allowing flexibility for movement and rotation of furniture and spatial elements.

For example, multi-sided or curved tables, which enable participants to adjust their seating angles easily, could enhance the quality of conversations and extend the duration of interactions.

Chart 10: Analysis of social/antisocial orientation in interactions between same-sex and opposite-sex individuals. Source: Author.

Kinetic / Movement Factors
Analyzing the video recordings with attention to time segmentation revealed how distances changed over time.

Given the environmental setup with a table placed between participants (measuring 80×80 cm), the only plausible kinetic codes were 2 and 3:

Code 3 represented situations where individuals were seated without placing their hands on the table. Code 2 corresponded to instances when both individuals placed their hands on the table, with proximity varying based on how close their arms and legs were [13-18].

In the initial 5-minute interval, participants generally maintained Code 3 distance, but during the second and third 5-minute intervals, the distance decreased, particularly among same-sex participants. However, in opposite-sex interactions, women tended to preserve more distance compared to men.

Architectural Implications of Kinetic / Movement Factors
Based on these findings, it is advisable that the separation element (such as a table) in interactive spaces should not be smaller than Code 1 distance (approximately 90 cm).

This would allow participants, regardless of gender pairing, to engage in conversations more comfortably over extended periods.

Chart 11: Analysis of kinetic/movement factors in interactions between same-sex and opposite-sex individuals. Source: Author.

Visual Code
After reviewing the recordings to analyze visual interactions (eye contact), it was observed that eye contact among same-sex participants was slightly more frequent, generally falling under Macular focus (M).

Among opposite-sex participants, eye contact was less direct, often categorized as Peripheral (P) or occasionally Macular (M).

When participants were surveyed after the sessions, all reported that they never noticed direct (Foveal) eye contact (Type 1) from their conversation partner, especially among opposite-sex pairs.

Chart 12: Analysis of visual communication factors in interactions between same-sex and opposite-sex individuals. Source: Author.

Tactile/Touch Code

Video analysis revealed that no physical contact occurred between participants during the conversations, except for occasional handshakes before or after the experiment [19-22].

To further validate this observation, participants were asked about any touch occurrences, and no cases were reported.

Thermal and Olfactory Codes

Participants were asked whether they felt the warmth or scent of the other participant during the session.

All reported that they did not experience such sensations, most likely due to the maintained 80 cm distance enforced by the table setup.

Voice Loudness

Analysis of sound recordings showed that participants' voice levels remained consistent throughout the interactions, whether they were interacting with same-sex or opposite-sex partners.

In this research, by examining factors affecting proxemic behaviors, an attempt was made to gather standardized proxemic data rooted in the Iranian cultural and social context for application in architectural design.

Since social behaviors and cultural norms evolve across generations, it is recommended that this study be replicated in five years, or in different social environments, to update the findings.

Conclusion

In this study, the similarities and differences in proxemic behaviors among individuals of the same and opposite sex were analyzed. The goal was to inform the design of interactive spaces where both types of social interactions could occur comfortably and naturally.

By considering proxemic patterns in spatial design, it becomes possible to create environments that not only enhance psychological comfort but also meet users' social needs at a higher quality.

The analysis focused on photographic data segmented by time intervals, and each of Edward Hall's proxemic criteria served as a reference framework.

The key findings from the study are summarized as follows: Social/Antisocial Orientation:

Same-sex individuals tended to maintain direct body orientation throughout interactions, whereas opposite-sex individuals, particularly women, preferred angled orientations and avoided direct facing during conversations.

Architectural implication: designs should allow flexible movement and adjustable seating to accommodate different orientations.

Kinetic / Movement Factors: Initially, individuals maintained greater distance, which gradually decreased over time, especially among same-sex participants. Opposite-sex participants, particularly women, maintained larger distances throughout.

Architectural implication: the space or elements (such as tables) between participants should not be smaller than a personal distance (around 90 cm).

Visual Communication: Same-sex individuals exhibited more frequent macular (face and head) visual focus, while opposite-sex interactions often shifted toward peripheral glances rather than direct eye contact.

Tactile, Thermal, and Olfactory Codes: Physical touch, sensing body warmth, or detecting scent were not reported, likely due to the maintained physical distance.

Voice Loudness: Participants maintained consistent voice levels, unaffected by the type of social pairing.

This study aimed to establish localized proxemic behavior data in Iran, similar to previous proxemic studies conducted in other countries.

Given the dynamic nature of culture and social norms, it is recommended that similar studies be conducted periodically (for example, every five years) or in different environments to track changes and update spatial design standards accordingly.

References
1. Talebi Z. Social relationships in urban spaces. Social Sciences Letter Journal. 2004. 24.
2. Gehl J. Life between buildings. New York: Van Nostrand Reinhold. 1987. 23.
3. Rios-Martinez J, Spalanzani A, Laugier C. From proxemics theory to socially-aware navigation: A survey. International Journal of Social Robotics. 2015. 7, 137-153.
4. Marquardt N, Greenberg S. Proxemic interactions: From theory to practice. Synthesis Lectures on Human-Centered Informatics. 2015. 8, 1-199.
5. Esparza-Ros F, Vaquero-Cristóbal R. Ethics and proxemics. In Anthropometry: Fundamentals of application and interpretation. Springer Nature Switzerland. 2025. 11-19.
6. Biswas M, Brass M. Syncing online: A methodological investigation into movement synchrony, proxemics, and self-other blurring in virtual spaces. PLOS One. 2024. 19.
7. Salehi Sh, Naghshineh R. Study of proxemic distances in urban spaces of Iran (Case study: Tehran). 3rd National Conference on Knowledge-Based Urban Development and Architecture. 2021.
8. Salehi Sh, Naghshineh R. Study of proxemic distances in urban spaces of Iran (Case study: Tehran). 3rd National Conference on Knowledge-Based Urban Development and Architecture. 2021.
9. Jones SE. A comparative proxemics analysis of dyadic interaction in selected subcultures of New York City. The Journal of Social Psychology. 1971. 84: 35-44.
10. Hall ET. A system for the notation of proxemic behavior 1. American anthropologist, 1963. 65: 1003-1026.

11. Osmond H. Function as the basis of psychiatric ward design. Psychiatric Services. 1957. 8: 23-27.

12. Watson OM, Graves TD. Quantitative Research in Proxemic Behavior 1. American Anthropologist. 1966. 68: 971-985.

13. Forston RF, Larson CU. The dynamics of space: An experimental study in proxemic behavior among Latin Americans and North Americans. Journal of Communication, 1968. 18: 109-116.

14. Giddens A, Sutton PW. Sociology. Polity press. 2009.

15. Hogan K. Can't get through: eight barriers to communication. Pelican Publishing. 2003.

16. Hall ET. The hidden dimension. Garden City, NY: Doubleday. 1966. 609.

17. Jones SE, Aiello JR. Proxemic behavior of black and white first-, third-, and fifth-grade children. Journal of Personality and Social Psychology. 1973. 25: 21.

18. Kim I, Sung J. New proxemics in new space: Proxemics in VR. Virtual Reality. 2024. 28: 85.

19. Krueger J. Extended cognition and the space of social interaction. Consciousness and cognition. 2011. 20: 643-657.

20. Marquardt N, Greenberg S. Informing the design of proxemic interactions. IEEE Pervasive Computing. 2012. 11: 14-23.

21. Rapaport A. Human aspects of urban form UK: Pergamon Press Ltd. 1977.

22. Yang Y, Baker S, Kannan A, Ramanan D. Recognizing proxemics in personal photos. In 2012 IEEE Conference on Computer Vision and Pattern Recognition. 2012. 3522-3529.