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An Investigation Into Interpersonal Space and Conversation Distances of Chinese People for Different Artwork Styles and Genders

Yiyue Li

School of Design, South China University of Technology, Guangzhou 510006, China

ABSTRACT

This study explored the interpersonal space (IPS) and conversation distances of Chinese people influenced by the presence of artwork in their interiors, and assessed the effects of both gender and artwork style (positive, neutral, and negative) on interpersonal space (IPS) and conversation distances. Sixty participants were recruited for this study. Participants were required to follow the same approach procedures in a face-to-face interpersonal space (IPS) and conversation distance task. This study may help to understand the benefits of people using positive or negative art decorations in a busy office environment with applications to interior design and social interaction.

Keywords: Exemplary paper, Human systems integration, Systems engineering, Systems modeling language

INTRODUCTION

Personal space is a spatial distance around our body that is not allowed to be violated by others. It is the place where we interact with the stimuli of the external world and is crucial to the interaction between individual behavior and their physical environment and directly affects their subjective feelings.

Personal space in 1959 by Edward Hall (ET-Hall) proposed that personal space should be clearly defined: according to the degree of closeness in interpersonal relationships will be divided into four kinds of personal space distance, respectively, intimate distance (0 ~ 18 inches), which is only the husband and wife, parents and children of this type of relationship to get along and talk about the use of space range, intimate distance can be divided into close range intimate distance and remote intimate Distance; personal distance (1.5 ~ 4 inches), which is between friends to get along and talk between the use of space range, this range of acquaintances and strangers can enter the range, the general range of acquaintances can enter the 1.5 inches, while the nearest range of strangers may be 4 inches; social distance (4 ~ 12 feet), generally applicable to non-personal matters in the place, such as dealing with work and other aspects. Public distance (12 to 25 feet), generally applies to personal social matters with strangers, such as speeches, lectures,

parties and some other large places. People should pay more attention to their personal space range while pursuing quality of life. People's perception of interpersonal distance in interactions can be influenced by many factors, such as gender, age, regional culture, and the context of interaction (Sommer, 1969). In addition, when people are in hostile and uncomfortable situations they tend to maintain a greater interpersonal distance to avoid threatening intrusion; conversely, in friendly and comfortable situations, people tend to maintain a smaller interpersonal distance (Sommer, 1969). 1993, Gu Fan did an experiment on interpersonal distance from three categories: age, personality, and gender, and concluded that age has an effect on interpersonal distance, personality factors change with age, the earthly distance is smaller for extroverted personalities and larger for introverted personalities, and the gender factor also changes with age, but the difference between the 16-year-old age group five significant effects. So the study of the spatial distance around our body has some significance for the study of human psychological cognition and behavior. And Ge Guohong et al. in 2009 explored the influence of different personalities of college students on personal spatial circle and the orientation effect of personal spatial circle, and concluded that inward and outward personalities do not significantly affect personal spatial distance, emotional stability or not triggered in a specific scene, so the conclusion that emotional stability also has no significant effect on earthly distance. Li Yuhua argued that people can only come from their environment to guide their behavior through cognitive environment. tajadura-Jiménez et al. found that positive and relaxing music in the environment mobilizes positive emotions in subjects, thus allowing others to come closer to their bodies (Sommer, 1959). Li Yang et al. concluded that office design and personal space and sense of domain are factors that influence people's office, but did not mention the place and role of artwork in office design. Zhu Yuting found the metaphorical representation of "warm colors - close interpersonal distance" and "cold colors - far interpersonal distance" through different color pictures and vocabulary to measure interpersonal distance (Zhu, 2018). Li Ting showed that the spatial distance under the concept of emotion has an effect on interpersonal distance through three categories of emotional words, emotional faces, and emotional audio (Li, 2019).

As of today, there are many factors that influence interpersonal distance relationships, and they are being paid more and more attention to. For example, research theories are centered on the personal spatial distance of interpersonal relationships, while there are few studies on interpersonal spatial distance around musculature and emotion, and this research theory is here to fill the gap of such studies.

This study will explore several issues of psychological distance based on the theory of comfort distance and conversation distance interpretation level, using the method of stopping distance. The experiments include:

1. Does the presence of artwork and the different overall emotional tone of the artwork as well as the texture make a difference to the psychological distance and talking distance of others? 2. Does the presence of artwork and the different placement of the artwork make a difference to the psychological distance and talking distance of individuals to others?

MATERIALS AND METHODS

Subjects

Fifty-one undergraduate and graduate students (23 males and 28 females) enrolled in full-time universities in different majors were randomly selected to be included in this study. All subjects were about 21 years old, right-handed, with normal or corrected bare eye vision, none of them had cognitive impairment or other disorders that could affect distance perception, and they gave informed consent to participate in this experiment. Each subject had no prior knowledge of the scientific purpose of this experimental study, the experimental methods, or the approval of the institutional psychology committee of South China University of Technology.

Experimental Apparatus and Measurements

The hardware of this experiment was a laptop computer with display and keyboard input, as well as a rangefinder apparatus for measuring distance, three artworks, and an instrument for measuring human psychological responses. The experiment was conducted using a forward stop study method using a digital laser meter (JM-G25240; JIMIHOME, Shanghai, China) with an accuracy of 2 mm and a measurement range of 0.05-40 m to measure the distance between the subject and the subject in an indoor space under the influence of the artwork. The digital laser meter was tested and corrected before each experiment to ensure the accuracy of the measurement data. Since it was limited to a specific scene in the office, the main subject was sitting and the subjects were standing, and the distance measured was from the center point of the main subject's chin to the center point of each subject's chin.

Experimental Setting and Subjects

The experiments were conducted in an empty room with white painted walls on all sides. During the experiment, the subject (21 years old, 172 cm tall, normal looking, male) wore the same white shirt and black suit throughout the experiment, and the subject wore casual clothes without any accessories. In order to prevent the chair from moving and affecting the data, we marked the initial position of the chair on the floor, and the artwork was hung on the wall behind the chair, the length of the wall was x meters, we divided the wall into five equal parts, and the artwork was divided into five positions, (see Figure 1 for the schematic diagram) and each subject was in the straight opposite of the main subject. center, experimental studies found that direct gaze produced more intrusive responses than avoidance of gaze, and that direct gaze can expand interpersonal distance (Bailenson et al., 2003; Ioannou et al., 2014). In order to simulate normal situations of everyday life on a straight-line test, the subject was asked to maintain a neutral expression during each experiment and would make eye contact with the subject.

Experimental Procedure

Two tasks were conducted in this study: comfort distance judgment and conversation distance judgment. Preliminary work was needed to prepare

Figure 1: Exoposition E. Grasset, Eugène Grasset. 1894.

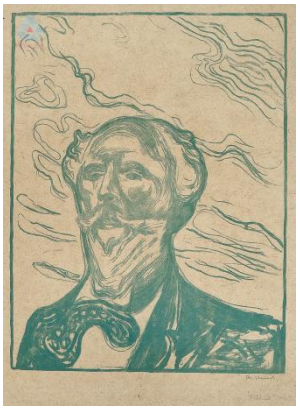

Figure 2: Emotional, Edvard Munch.

before testing in this study. We first pre-selected a dozen prints that met our requirements, and in order to verify the effect of the selected prints on the subjects' emotions and feelings, the method was to ask the public to select, through a questionnaire, the three prints that met their psychological expectations and best matched the three emotions (negative 5 - neutral 0 - positive 5). The results show that Figure 1 (AVG = 3.5) Figure 2 (AVG = 0.3) Figure 3 (AVG=−3.7).

The experiment was conducted in groups of three, with one person as the primary test subject, one person as the subject, and one person as the guide. Each subject received instructions on the experimental procedure in advance before starting the test. The prints were hung in five positions as shown in Figure 2. Three prints of different sizes and with the same content could be placed in each of the five positions shown in Figure 4 during the experiment. The initial distance between the main test subject and the subject was 3 m.

Then the participant was asked to enter the room, sit down at the farthest distance from the subject's straight line level and observe the surroundings for 10 seconds before observing the artwork for 30 seconds, 30 seconds ended and then hear the instruction to get up and approach the subject according to the psychological distance or conversation distance, and stop approaching

Figure 3: La femme qui pleure, I, Pablo Picasso (1881–1973).

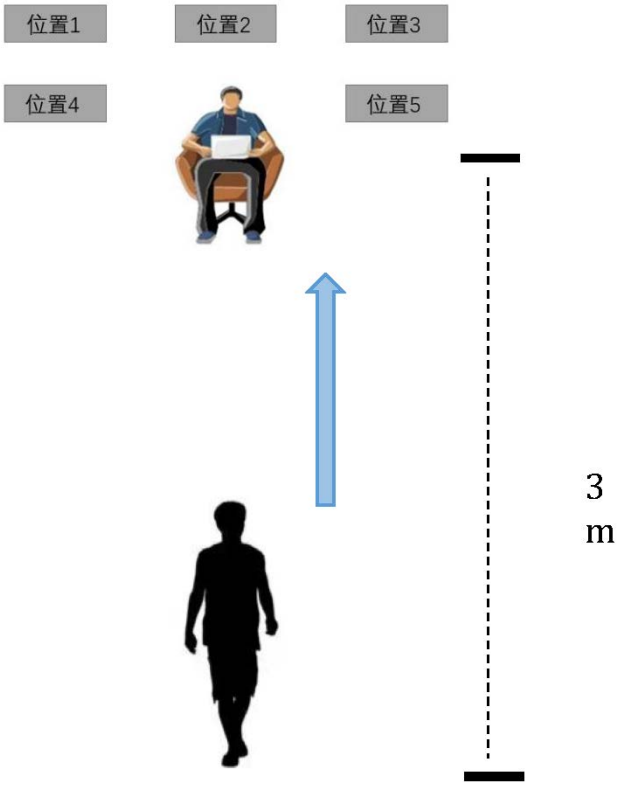

Figure 4: Schematic diagram of the experimental scene.

forward when the subject reached the ideal distance of the subject's psychology, at which time the subject took out a distance meter and placed it in the center of his chin to measure the horizontal direction. In order to accurately measure the distance, the central surface of the chin and jaw of the subject was marked, and all participants were given the opportunity to slightly adjust their mental position in order to determine the comfortable distance and conversation distance. Each subject's mental distance and conversation

distance would be entered into the computer and converted into the appropriate score to count toward that person's score, and each distance trial was repeated three times, and this process was repeated for male alliance, female alliance, and male and female alliance in five positions. (5 positions * 3 alliances * 3 repetitions * 3 styles) Trials were assigned in random order.

Each subject performed a total of 30 trials throughout the experiment. A 10-minute break was taken between tasks to prevent visual fatigue.

STATISTICAL ANALYSIS

The data were analyzed using spss, and the significance level was set at 0.05.The comfort distance and talking distance were measured in meters. The mean distance for each trial was calculated for further analysis, and separate ANOVAs and analyses were performed for each subject for both the comfort distance and talk distance tasks. Comfort distance and conversation distance were analyzed separately using ANOVA, and interpersonal distance and conversation distance were both analyzed using a 2*3*5 ANOVA with the subject's gender (male, female), three artwork styles, and five artwork placements.

RESULTS

Conclusion of Comfortable Distance

Table 1 below shows the three-way ANOVA for the gender factor, artwork style factor, and artwork placement factor on the comfort distance index, and the ANOVA findings show that the test significance p for the subject's gender factor and artwork style factor is less than 0.05, indicating that the gender factor [$F(1, 1005) = 5.062$, $p<0.03$)], artwork style factor [$F(1, 1006) = 8.188$, $p<0.01$] are significantly different in terms of comfort distance. However, the ANOVA showed that the significant p for both the artwork placement factor and the interaction term were greater than 0.05, indicating that there was no significant difference in the artwork placement factor and there was no interaction between the factors.

With significant differences in the subject's gender factor and artwork style factor, the differences in each category were further studied, which shows the analysis of the differences in the comfort distance index between the gender factors, from which it can be seen that the mean comfort distance for men is 1.938 m and for women is 2.036 m.The difference test corresponds to a significant P of $0.025<0.05$, indicating a significant difference between men and women, with women having significantly higher mean comfort distances than men, a conclusion that can also be drawn from the following marginal plots (Table 2).

The following is the analysis of the difference between the artwork style positivity in the comfort distance index, from Table 3, it can be seen that the artwork picture as a whole expresses positive energy, positive factors corresponding to the average value of the comfort distance of 1.906 meters, the artwork picture as a whole expresses the neutral emotional factors corresponding to the average value of the comfort distance of 1.944 meters, the

Table 1. Test for inter-subject effects.

Dependent variable:comfortable distance					
Source	**Type III sum of squares**	**df**	**Mean Square**	**F**	**Sig.**
Calibration Model	4.459[a]	29	.154	.950	.544
intercept	1338.675	1	1338.675	8270.086	.000
sex	.819	1	.819	5.062	.025
Artwork style	2.651	2	1.325	8.188	.000
Location	.054	4	.013	.083	.988
Gender * Artwork style	.164	2	.082	.506	.603
Gender * Location	.102	4	.026	.158	.959
Location*Artwork style	.234	8	.029	.181	.993
Gender * Artwork style* Location	.200	8	.025	.154	.996
Error	50.989	315	.162		
Total	1426.095	345			
Total of corrections	55.447	344			

[a]R-squared = .080 (adjust R-squared = -.004)

Table 2. Pairwise comparison.

Dependent variablecomfortable distance						
(I) sex	**(J) sex**	**Mean Difference (I-J)**	**Standard Error**	**Sig.[a]**	**95% Confidence interval[a]**	
					Lower limit	**Upper limit**
Male	Female	−.098*	.044	.025	−.184	−.012
Female	Male	.098*	.044	.025	.012	.184

Based on estimating the marginal mean

*The difference in means is more significant at the .05 level.

[a]Adjustment for multiple comparisons: Least significant difference (equivalent to no adjustment).

Table 3. Estimate.

Dependent variable comfortable distance				
Artwork Style	**Average value**	**Standard Error**	**95% Confidence interval[a]**	
			Lower limit	**Upper limit**
Active	1.906	.038	1.832	1.981
Neutral	1.944	.038	1.870	2.019
Negative	2.110	.038	2.035	2.184

artwork picture as a whole expresses negative energy, negative emotional factors corresponding to the comfort mean value of distance is 2.110 meters.

From the results of the difference test in the table below, it can be seen that the mean difference between negative emotion and positive emotion and neutral emotion expressed in the artwork screen as a whole is positive, and the

Table 4. Multiple comparisons.

Comfortable distance LSD						
(I)Artwork Style	(J)Artwork Style	Mean Difference (I-J)	Standard Error	Sig.	95% Confidence interval[a]	
					Lower limit	Upper limit
Active	Neutral	−.0375	.05306	.481	−.1418	.0669
	Negative	−.2094*	.05306	.000	−.3138	−.1050
Neutral	Active	.0375	.05306	.481	−.0669	.1418
	Negative	−.1720*	.05306	.001	−.2764	−.0676
Negative	Active	.2094*	.05306	.000	.1050	.3138
	Neutral	.1720*	.05306	.001	.0676	.2764

Based on observed mean values.

The error term is the mean square (error) = .162.

*The difference in means is more significant at the .05 level.

corresponding significant P is less than 0.05, indicating that there is a significant difference between the negative emotion factor and the positive emotion factor and the neutral emotion factor, and the comfort index corresponding to the negative emotion factor is significantly higher than the positive emotion factor and the neutral emotion factor, from the following marginal plot (Table 4) this conclusion also has to be drawn.

Conclusion of the Conversation Distance

Table 5 below shows the three-way ANOVA for gender, artwork style factor, and artwork location factor on the talk distance index, and from the following results, it can be seen that the test significance P for gender factor and artwork style factor are less than 0.05, indicating that there is a significant difference between gender factor [$F(1, 1105)=8.340$, $p<0.03$)], artwork style positivity factor [$F(1, 1106)= 4.447$, $p<0.03$)] were significantly different in terms of conversation distance, while the significant P for the artwork location factor and other interaction terms were greater than 0.05, indicating that there was no significant difference in the artwork placement location factor and no interaction between the factors.

In the case of significant differences, the differences in each category were further studied, which shows the analysis of the differences in the indicators of talking distance by gender factors, from which it can be seen that the mean value of talking distance for men is 1.835 m and for women is 1.950 m.The difference test corresponds to a significant P of 0.004<0.05, indicating a significant difference between men and women, with women having a significantly higher mean value of talking distance than men, a conclusion that can also be drawn from the following marginal chart6.

The following is the analysis of the difference between the artwork style emotional factors in the conversation distance index, from Table 7 can be seen, the artwork picture as a whole expressed positive energy, positive factors corresponding to the average value of the conversation distance of

Table 5. Test for inter-subject effects.

Dependent variable:Talking distance					
Source	**Type III sum of squares**	**df**	**Mean Square**	**F**	**Sig.**
Calibration Model	2.894[a]	29	.100	.742	.833
intercept	1214.608	1	1214.608	9029.782	.000
sex	1.122	1	1.122	8.340	.004
Artwork Style	1.196	2	.598	4.447	.012
Location	.076	4	.019	.141	.967
sex* Artwork Style	.050	2	.025	.186	.831
sex* Location	.043	4	.011	.079	.989
Artwork Style * Location	.159	8	.020	.148	.997
sex* Artwork Style * Location	.181	8	.023	.168	.995
Error	42.371	315	.135		
Total	1290.711	345			
Total of corrections	45.265	344			

[a]R-squared = .064 (adjusted R-squared = -.022)

Table 6. Pairwise comparison.

Dependent variable:Talking distance						
(I) Sex	**(J) Sex**	**Mean Difference(I-J)**	**Standard Error**	**Sig.[a]**	**95% Confidence interval[a]**	
					Lower limit	**Upper limit**
Male	Female	-.115*	.040	.004	-.193	-.037
Female	Male	.115*	.040	.004	.037	.193

Based on estimating the marginal mean

*The difference in means is more significant at the .05 level.

[a]Adjustment for multiple comparisons: Least significant difference (equivalent to no adjustment).

Table 7. Estimate.

Dependent variable:Talking distance				
Artwork Style	**Average value**	**Standard Error**	**95% Confidence interval**	
			Lower limit	**Upper limit**
Active	1.824	.034	1.756	1.891
Neutral	1.885	.034	1.818	1.953
Negative	1.969	.034	1.901	2.036

1.824 meters, the artwork picture as a whole expressed neutral emotional factors corresponding to the average value of the conversation distance of 1.855 meters, the artwork picture as a whole expressed negative energy, negative emotional factors corresponding to the conversation the mean value of distance is 1.969 meters.

Table 8. Multiple comparisons.

Talking distance LSD						
(I)Artwork Style	(J)Artwork Style	Mean Difference (I-J)	Standard Error	Sig.	95% Confidence interval	
					Lower limit	Upper limit
Active	Neutral	−.0606	.04837	.211	−.1558	.0346
	Negative	−.1475*	.04837	.002	−.2426	−.0523
Neutral	Active	.0606	.04837	.211	−.0346	.1558
	Negative	−.0869	.04837	.073	−.1820	.0083
Negative	Active	.1475*	.04837	.002	.0523	.2426
	Neutral	.0869	.04837	.073	−.0083	.1820

Based on the observed mean value.

The error term is the mean square (error) = .135

*The difference in means is more significant at the .05 level.

From the results of the difference test in Table 8 below, it is clear that the mean difference between negative and positive is positive and corresponds to a significant P less than 0.05, indicating that there is a significant difference between negative and positive, and the comfort distance indicator corresponding to negative is significantly higher than the positive factor.

In the case of significant differences, further study the differences of each category, Cohen'sd effect size is a common effect size to calculate the gap between groups, comfort distance artwork style factor effect size d = 0.937, gender factor effect size d = 0.844, conversation distance artwork style factor effect size d = 0.905, gender factor effect amount d = 0.898, the larger the value of the effect amount indicates a slightly more significant effect, so the effect amount of the artwork style factor is smaller than the effect amount of the gender factor, indicating that the artwork style factor can influence the interpersonal space more than the gender factor.

Analysis of Experimental Results

From the above experimental results, it can be seen that only the gender factor and artwork style factor differed in the index of comfortable interpersonal distance, while no significant differences existed in the other factors and the interaction term of each factor. On the gender factor, the average comfortable interpersonal distance for women was 2.036 meters, and the average comfortable interpersonal distance for men was 1.938 meters. The average comfortable interpersonal distance for women was significantly higher than the average comfortable interpersonal distance for men, which means that when women and men approach face to face, the personal spatial distance required for women is greater than the personal spatial distance required for men. In terms of the positivity factor, there is a significant difference between the negative factor and the positive and neutral factors in the comfortable interpersonal distance index, the comfortable interpersonal distance

index corresponding to the negative factor is 2.110 meters, the comfortable interpersonal distance index corresponding to the neutral factor is 1.944 meters, the comfortable interpersonal distance index corresponding to the positive factor is 1.906 meters, the comfortable interpersonal distance corresponding to the negative factor is significantly higher than the positive factor , the effect of neutral factors on comfortable interpersonal distance, and the effect of neutral factors on comfortable interpersonal distance is again higher than the effect of positive factors on comfortable interpersonal distance. In the indicators of conversational interpersonal distance, there were also differences only in the gender factor, and the positive factor. In terms of gender, the interpersonal distance of conversation is 1.950 m for women and 1.835 m for men. The interpersonal distance required for women's conversation is significantly greater than the interpersonal distance required for men's conversation, and the overall interpersonal distance for women is farther than that for men in terms of both comfortable interpersonal distance and conversation interpersonal distance, which indicates that because women are slightly smaller and have a high sense of precaution making women's need for greater distance from outside human contact. On the artwork style factor, the interpersonal distance of conversation corresponding to the positive factor is 1.824 m, the interpersonal distance of conversation corresponding to the neutral factor is 1.855 m, and the interpersonal distance of conversation corresponding to the negative factor is 1.969 m. The interpersonal distance of conversation corresponding to the negative factor is significantly higher than the interpersonal distance of conversation corresponding to the positive factor, which means that on the gender factor, both males and females, their Talking interpersonal distance values are smaller than their comfortable interpersonal distance, implying that talking also subconsciously brings people closer to each other. Comparing the positive, neutral, and negative factors with the blank factor, the interpersonal distance with these factors has a significant change than the interpersonal distance without these factors, which means that the presence of these positive factors will make people closer to each other, while the presence of negative factors will make people further away from each other. And the change in the location of the positive factors in the spatial range did not have a significant effect on interpersonal distance.

CONCLUSION

Through the analysis of the above-mentioned experimental results, emotions have an impact on human behavior, and if you see artwork with negative factors, the negative emotions will slow down people's actions. Visitors will most likely choose to visit the exhibition hall again. In addition, artwork can also choose to hang at home or personal workplace, people who like to socialize can choose artwork with positive emotions, to achieve the effect of social distance; while people with a strong personal awareness of the field can choose artwork with a slightly negative emotions, so that they and each other to maintain the distance that makes them feel most comfortable.

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