The Effect of Gender, Religiosity and Personality on the Interpersonal Distance
Preference: A Virtual Reality Study

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This article has been accepted for publication in *Communication Research Reports*, published by
Taylor & Francis. (doi: 10.1080/08824096.2020.1806811)

Abstract

Interpersonal distance (ID) is an important aspect of human nonverbal behavior. Both situational and dispositional factors play roles in interpersonal distance preference (IDP). In the present study, we investigated the effect of gender, religiosity, and Big Five personality factors on IDP in an Iranian sample. Forty-six university students watched fourteen 360-degree video clips via a virtual reality headset. In each video-clip, a male or a female actor spoke toward the camera from a particular distance and participants rated the favorability of each distance. Results showed that at the middle-range distances, religious individuals exhibited a pronounced gender bias by rating their distance from the same gender actor more favorable than the same distance from the opposite gender actor. Furthermore, openness to experience was correlated with the favorability of the middle-range distances. These findings can be justified by dominant Islamic values in Iran and specific characteristics of openness to experience.

Keywords: Interpersonal Distance, Personal Space, Nonverbal Behavior, Religion, Virtual Reality

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Nonverbal signals have an undeniable effect on human interactions. It is suggested that a considerable percentage of an interpersonal message is conveyed via nonverbal clues (Hickson, Stack, and Moore, 2004). Edward T. Hall, an American anthropologist coined the term *proxemics* and defined it as “the study of men’s perception and use of space” (Hall, 1968, p.83). Hall divided human’s use of space into three categories: (a) fixed space such as walls or territories, (b) semi-fixed space such as furniture, and (c) dynamic space which is the distance that people keep while interacting with others and is usually called interpersonal distance (ID) or personal space. Hayduk (1983) defined personal space as “the area individuals maintain around themselves into which others cannot intrude without arousing discomfort. Personal space is often described as a bubble of space surrounding a person” (p. 293). People try to keep others at a particular distance and if their personal space is intruded, they will display arousal, anxiety, and inconvenience (Thompson, Aiello and Epstein, 1979).

Researchers in the fields of anthropology, communication, and social psychology have examined the effects of various factors on the interpersonal distance preference (IDP). Intimacy, for example, has been found to exert an important effect on ID regulation, in a way that more intimate partners prefer to keep closer ID (Dolphin, 1988; Gifford, 1982; Little, 1968). Within-group interactions also take place in closer IDs than between-group interactions (Novelli, Drury, and Reicher, 2010). Other factors that may affect IDP include stress (Dosey and Meisels, 1969; Hayduk, 1983; Long, 1984), status (Gifford, 1982), size of the room and height of the ceiling (Madanipour, 2003), outdoor or indoor environment (Cochran, Hale and Hissam 1984), clothing

(Workman, 1987), attachment style (Bar-Haim, Aveizer, Berson and Sagi, 2002), and social stigma (Madanipour, 2003).

The influence of culture on nonverbal communication has long been investigated (Gudykunst, Ting-Toomey, and Nishida, 1996; Hill, Watson, and Rivers, 2007; Monaghan, Goodman, and Robinson, 2012, Wood, 2016). For example, whereas the “thumbs up” gesture is construed positively in many cultures, it has a pejorative meaning in Iran similar to the “middle finger” gesture in the west (Archer, 1997). Middle Eastern men may also hug and kiss each other on the cheek in public, whereas such an encounter may be seen inappropriate in the United States (Wood, 2016). Cultural differences have also been observed in IDP. Several studies have pointed out that people in different countries vary in the distance they keep while interacting in daily life (Hall, 1966; Little, 1968; Sorokowska et al., 2017). For instance, Little (1968) examined the preferred ID of university students in the following countries: United States, Sweden, Italy, Scotland, and Greece. He found that participants from the Mediterranean countries (i.e., Greece and Italy) preferred closer IDs compared to Northern Europeans (i.e., Sweden and Scotland). In a recent study, Sorokowska et al., (2017) suggested that temperature differences between the world regions can explain some of these observed differences. Similarly, ID in male-male, female-female, and male-female interactions differs markedly across nations. Although the studies have sometimes yielded contradictory results (Gifford, 1982; Hayduk, 1983), the overall findings suggest that in male-male interactions, ID is longer than in male-female or female-female interactions (Bailey, Hartnett, and Gibson, 1972; Beaulieu, 2004; Gifford, 1982; Iachini et al., 2016). However, research in two majority Muslim countries, Egypt and Iran (Aliakbari, Faraji, and Pourshakibae, 2011) have indicated that male-female interactions require the largest ID between the interactants. The authors of these studies have suggested that this effect may be due

to the dominant Islamic values in these countries. Islam teachings forbid Muslims to have any type of physical contact with the members of the opposite gender who are not close family members, known as *non-mahrams* (Boulanouar, 2006). For instance, a Muslim man is not allowed to touch his female acquaintances or friends and a Muslim woman is prohibited from any physical contact with her male friends. This law may make religious individuals more likely to show a gender bias in IDP while interacting with a non-mahram to ensure no physical contact will happen. In the context of nonverbal behavior research, this religious notion has been largely overlooked. In a majority Muslim country, people may regulate their ID depending on the extent to which they adhere to Islamic values. To fill this gap, this study aimed to shed light on the effect of religiosity on the preferred ID in the male-male, female-female, and male-female interactions.

H1: Religious individuals, compared to non-religious individuals, show a pronounced gender bias in IDP.

Personality traits have also been investigated in the field of nonverbal behavior (Cole, 2000; De Julio and Duffy, 1977). Ickinger and Morris (2001) observed that individuals who hold a negative attitude toward the world and others maintain a larger ID in their interactions. Gifford (1982) found that people who score high on coldness, ambition, and competition prefer to sit farther from others. Furthermore, one experiment indicated that people who rate themselves as energetic, emotionally stable, and open often interact while keeping a shorter ID (Iachini et al., 2015). The five-factor model of personality comprises five broad personality categories, i.e., openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism (Costa and McCrae, 1992). This model is popular in personality research and has been extensively studied in psychology, as well as other branches of behavioral science. In the interpersonal communication context, for instance, Berry & Hansen (2000) and Cuperman & Ickinger (2009) investigated the

effect of Big Five personality factors on the dyadic interaction. They found that extraversion, agreeableness, and openness to experience were correlated with several verbal and nonverbal measures of interaction quality. In the present study, we used this model in order to investigate the relationship of the personality factors with IDP.

RQ1: Is there a relationship between Big Five personality factors and IDP?

ID researchers have conducted their studies by using a variety of methods which can be categorized into three types: (a) observation, (b) projection such as drawing human figures, and (c) experiment such as stop-distance or zoom-in zoom-out. Since the results of projective methods have low correlations with other methods, It is considered unreliable and thus suggested to be abolished (Hayduk,1983). Virtual Reality (VR) is a new technique that allows researchers to examine human behavior in situations that cannot be easily studied in the real world. This technology has also been used in proxemics studies (for example Bailenson, Blascovich, Beall and Loomis, 2003; Iachini, Coello, Frassinetti, and Ruggiero, 2014; Iachini et al., 2015). The high ecological validity of VR can help overcome the criticisms that proxemics researchers have regularly been faced (Iachini et al., 2016).¹

¹ VR content may be produced in either two types: (a) 360 video clips (such as the present study) and (b) graphical environment which utilizes avatars (i.e., virtual characters controlled by humans) and agents (i.e., virtual characters controlled by computer) and can track the activities of the participants. Interaction or identification with avatars and agents could have implications for human-computer relationship. For example, several studies have investigated the player-avatar relationship in the context of videogames (see Banks and Bowman, 2013; 2016; Downs, Bowman, and Banks, 2019). For a discussion on the effect of various factors on ‘presence’ (i.e., feeling on being there in the virtual environment) see Cummings and Bailenson (2016).

Method

Participants

From 75 university students (43 women, 32 men) who filled out the religiosity and personality questionnaires (mean age = 22.05, SD = 1.67), 48 students were called to participate in the VR experiment. Individuals whose total score on the religiosity scale was higher than 70 percent or lower than 40 percent of the highest possible score were categorized into religious and non-religious groups, respectively.² The data from two of the participants were removed due to an error in the experimental procedure. Total 46 students (24 women, 22 men) completed the study (mean age = 22.15, SD = 1.64) in four groups, namely religious men (n = 11), non-religious men (n = 11), religious women (n = 15) and non-religious women (n = 9).

Measures

Religiosity Scale for Iranian College Students. This 113-item questionnaire was created by Khodayarifard et al. (2006) and is based on the human relationship with God, self, others, and the world. It includes four subscales, namely religious knowledge, religious beliefs, religious affections and tendencies, and obligation to religious duties. The criterion and construct validities of this scale were confirmed through the significant correlation with another religiosity scale and factor analysis, respectively. These authors also reported the alpha coefficients of the subscales of this questionnaire between .76 and .95 (Khodayarifard et al., 2013). In the present study, the alpha coefficients for the four subscales were as follows: religious knowledge = .74, religious beliefs = .62, religious affections and tendencies = .81, and obligation to religious duties = .97.

² As suggested by the developers of the scale (Khodayarifard et al., 2006), we considered 70 percent score as the cutoff for the selection of religious individuals. The non-religious cutoff was set to be two SDs below that.

NEO Five-Factor Inventory (NEO-FFI). This scale is a short form of NEO Five-Factor Inventory. It has 60 items and aims to assess five factors of personality (Big Five) that are openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism on a 5-item Likert scale. This scale has been translated into different languages and is one of the most used personality assessment inventories. Nilforooshan et al. (2012) investigated the psychometric properties of the Farsi version of NEO-FFI and reported the test-retest reliability of all the factors between .72 and .89. In our study, the alpha coefficients for the subscales were as follows: openness to experience = .65, conscientiousness = .82, extraversion = .80, agreeableness = .71, and neuroticism = .55.

Distance Favorability Questions. In order to assess the favorability of different IDs, we asked a single question from the participants after they watched each of the video clips. They were required to rate the favorability of their distance from the actor/actress on a five-point Likert scale (1 = *very unfavorable*, 5 = *very favorable*).

Video Clips

Total 14 video clips were recorded of a man (age= 22, height = 176 cm [5 feet and 9 inches], weight = 65 kg [143 lb]) and woman (age = 22, height = 171 cm [5 feet and 7 inches], weight = 58 kg [121 lb]). Each clip lasted around 40 seconds. These video clips were 360-degree, monoscopic, and when watched via a head-mounted display, would surround the viewer. In each of the video clips, the actor/actress stood facing the camera from a certain distance (10, 25, 40, 55, 70, 85, 100 centimeters [3.94, 9.84, 15.75, 21.65, 27.56, 33.46, 39.37 inches])³, talking about a neutral topic (i.e., giving a certain direction to a specific address). The content of the speech was

³ We categorized these distances into three categories: close (10 and 25 cm [3.94 and 9.84 in]), middle-range (40 and 55 cm [15.75 and 21.65 in]) and far (70, 85, 100 cm [27.56, 33.46, and 39.37 in]) distances.

the same in all the videos. These video clips were produced with several considerations. The height of the camera was set to be equal to the height of the eyes of the actors so that all the participants perceived themselves as tall as the actors. Also, the actors were told to suppress their body movements and facial expressions as much as possible. They were also told to wear casual clothes and talk with a neutral and non-emotional tone. After each video clip, the following question popped up: “If the most favorable distance for the conversation receives five and the least favorable distance for the conversation receives one, how do you rate your distance from the actor in the clip you just watched? Announce your response with a loud voice”. The scores assigned to each distance indicated the desirability of each distance and corresponded to our dependent variable (i.e., IDP). These video clips were presented in random order via Oculus Rift® head-mounted display. The length of each experimental session was approximately 15 minutes.

Results

In order to analyze the effect of religiosity and gender of the participants and actors on IDP, a mixed-design repeated-measure ANOVA with one between-subject (i.e., group type) and two within subject (i.e., distance, actor gender) variables was conducted. Due to the violation of the sphericity test, *dfs* are adjusted and Huynh-Feldt values are reported.

We found a significant main effect of distance, $F(4.30, 180.34) = 195.14, p < .001, \eta_p^2 = .82$; showing that regardless of group type and actors gender, the desirability of IDs varied in a way that farther distances were considered more favorable than the closer distances (Figure 1).

Insert Figure 1 here

In addition, there was a significant interaction between the group type, distances and actors gender, $F(17.54, 245.56) = 2.55, p < .001, \eta_p^2 = .15$. Further analysis revealed that at middle-range distances (i.e., 40 and 55 cm [15.75 and 21.65 in]), religious people exhibited a gender bias by scoring the suitability of their distance from the same-gender actor higher than their distance from the opposite-gender actor (Figure 2). At 40 cm (15.75 in) distance, religious men rated the favorability of their distance from the actor ($M = 2.18, SD = 1.08$) significantly higher than their distance from the actress ($M = 1.27, SD = .78$), $t(10) = 2.88, p = .016$. This pattern was also observed at 55 cm (21.65 in) distance, where religious men rated the favorability of the presence of the actor ($M = 2.82, SD = 1.08$) higher than that of the actress ($M = 1.55, SD = .82$), $t(10) = 3.32, p = .007$. Religious women also exhibited a gender bias at this distance. The difference between the scores they assigned to the favorability of their distance from the actress ($M = 2.87, SD = .83$) was significantly higher than the scores assigned to their distance from the actor ($M = 1.87, SD = 1.13$), $t(14) = 3.87, p = .002$.

Insert Figure 2 here

Next, we performed a correlation analysis between the five NEO-FFI components and the mean scores assigned to the seven distances. Results revealed that at middle-range distances, openness to experience was positively associated with the suitability of ID from the same-gender actor. At 40 cm (15.75 in) distance, in religious men and women, openness to experience scores were correlated with the favorability of ID from the same-gender actors. At this distance, religious men whose openness to experience was higher, rated the presence of the actor more favorable, $r(9) = .64, p = .035$. Similarly, religious women with higher openness to experience perceived their distance from the actress at 40 cm more favorable, $r(13) = .59, p = .020$. This correlation between openness to experience and the favorability of ID from the same-gender actor was also evident at

55 cm (21.65 in) in religious women , $r(13) = .67$, $p = .006$, and non-religious women $r(7) = .72$, $p = .029$. Correlation tables could be found in the supplementary material.

Discussion

This study examined the role of gender, religiosity, and Big Five personality factors in IDP by using a novel experimental procedure. The results evinced that in a range from 10 to 100 cm (3.94 to 39.37 inches), far distances were considered more favorable than closer distances across all the groups. In other words, regardless of the group type and the gender of the actors, there was a consensus among the participants on the appropriateness of the close and far distances. Such a consensus, however, was absent on the suitability of the middle-range distances. At these distances, for example, religious men and women preferred the presence of the same-gender actor to the presence of the opposite-gender actor, thus showing gender bias in their ID evaluation. Preferring the presence of the same-gender actor to the opposite-gender actor is in line with the findings of the previous proxemics studies in the majority Muslim countries, indicating a general sensitivity to ID between the self and non-mahrams (Aliakbari et al., 2011). Here we showed that such sensitivity was only found in religious individuals and the gender of the actors did not affect the suitability of ID in the non-religious individuals.

Furthermore, we found an association between the openness to experience and the favorability of IDs at the middle-range distances. Openness to experience is defined as “the proactive seeking and appreciation of experience for its own sake, and as toleration for and exploration of the unfamiliar situations” (Piedmont, 2013, p.87). It has been linked to having nontraditional attitudes, higher behavioral flexibility, and lower defensiveness (McCrae & Costa, 1997; Zhao and Seibert, 2006). The positive correlation between the scores of openness to experience and the suitability of the middle-range distances suggests that people with high

openness are more tolerant to the proximity of their interactants and show less aversion when seeing them closer to their bodies.

One of the limitations of this study was that it investigated IDP only in the passive condition. Since we used pre-created video clips, participants could not adjust their distance from the actors actively. We suggest future studies to include both passive and active conditions in order to see whether the findings of this study replicate in active IDP or not. Also, due to the technical restraints of the camera, We were not able to record the video clips from distances farther than 100 cm (39.37 in). Future studies can overcome this limitation by using advanced cameras that can record with higher resolutions. The validity and reliability of NEO-FFI may be another limitation. Although previous studies (e.g. Nilforooshan et al., 2012) have found Farsi version to be a valid and reliable instrument, our analysis did not yield satisfactory results. Specifically, the alpha coefficient scores for openness to experience and neuroticism were not appropriate. This was also the case for the religious beliefs component in the religiosity scale. One reason for this may be the small sample size used in this study. Since one of the key findings of the current study was the relationship between openness to experience and favorability of middle-range distances in the same-gender interactions, the low reliability of openness to experience may weaken the results. Thus, future studies need to take robust measures to ensure the validity and reliability of their instruments. Finally, our finding regarding the effect of religiosity on IDP is limited to a Muslim community. Future researchers may study a more religiously diverse sample in order to maximize the generalizability of their findings.

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Figures

Figure 1. Mean scores assigned to each distance in all four groups. Distances in inches: 3.94, 9.84, 15.75, 21.65, 27.56, 33.46, 39.37. Bars represent 95% CI

Figure 2. Means of the scores assigned to middle-range distances (i.e., 40 and 55 cm [15.75 and 21.65 in]) in each group. Bars represent 95% CI