

Testing an Immersive Virtual Environment for Decreasing Intergroup Anxiety among University Students: An Interpersonal Perspective

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Abstract—This study examined the use of an immersive virtual environment (IVE) in decreasing intergroup anxiety among university students. In Dinner-time360¹, the students engaged in an interpersonal encounter by sharing a virtual dinner table with someone from another linguistic or cultural group. A control group watched the documentary in a traditional 2D format. The results showed that the documentary reduced intergroup anxiety in both situations, particularly among students with high anxiety who engaged in the IVE. For the IVE viewers, the decrease in intergroup anxiety was connected to two interpersonal elements: perceptions of the character's immediacy and an increased level of homophily. These findings provide insights into the possibilities of IVEs in multicultural learning among university students.

Keywords—multicultural learning, intergroup anxiety, interpersonal communication, immersive virtual environment, parasocial contact

1 Introduction

University education places great emphasis on multicultural competence, and students are encouraged to build contacts outside their home country. Multicultural competence is defined as “the awareness, knowledge, skills, and actions that are needed to work effectively across cultural groups and to work with complex multicultural and social justice issues” [1, p. XX]. Engaging in multicultural encounters is important for students to be able to enter international careers. However, people often experience anxiety toward people that are different from themselves, the so-called outgroup [2]. Indeed, some students may be reluctant to pursue international careers because of their intergroup anxiety and stereotyped way of thinking. Meeting culturally diverse people, for example via student exchanges, seems to be the best method for decreasing such anxiety. However, such initiatives may be inaccessible for students with lower economic status. Currently, the COVID-19 pandemic also prohibits students from taking part in international student exchanges. Consequently, many university students are missing out on opportunities to get used to and practice encounters with foreigners.

¹ Dinnertime360 is an IVE created by a company named Lyfta.

Immersive virtual environments (IVEs) provide one means for students to engage in multicultural encounters without leaving their home university – even in their living rooms. This study focuses on an IVE called Dinnertime360, in which students engage in *parasocial contact* by sharing a virtual dinner table with an outgroup member, that is, someone with a cultural and linguistic background other than theirs. Studies have shown that, in addition to direct face-to-face contact, mediated (i.e., parasocial) contact decreases the anxiety felt in encountering outgroup members [3], [4], [5]. Thus, IVEs such as Dinnertime360 may work as a tool for multicultural learning by providing a convenient and safe place for experiencing contact with outgroup members such as those considered foreign. However, IVEs’ potential for decreasing intergroup anxiety is still largely unexplored in educational settings.

Blascovich et al. [6, p. 105] define a virtual environment as “synthetic sensory information that leads to perceptions of environments and their contents as if they were not synthetic. An [IVE] is one that perceptually surrounds an individual.” Typically, IVEs contain stereoscopic, 3D, or 360-degree views, other sensory information, and interactivity. The latest research suggests that IVEs can evoke positive responses such as empathy toward outgroup members; see e.g., [7], [8]. IVEs have been designed previously for educational purposes, such as reducing communication apprehension [9], enhancing teachers’ empathy skills [10], and increasing learning motivation [11].

In this study, we investigated how university students’ parasocial contact with a foreigner, an immigrant to Finland, via Dinnertime360’s IVE and 2D versions, affect their intergroup anxiety, a key concept in intergroup contact [12]. In addition, we explored which interpersonal elements are significant in the contact. We were particularly interested in understanding whether experiencing parasocial contact in an IVE could provide a more intense interpersonal experience with the documentary’s culturally diverse character than parasocial contact through a traditional 2D documentary. An intense positive encounter may, in turn, lower the threshold for engaging in face-to-face multicultural encounters in the future.

2 Intergroup contact and intergroup anxiety

According to Stephan [2] intergroup anxiety is anxiety that individuals experience when they anticipate or engage in intergroup contact. For example, Mak et al. [13] found that Australian domestic students who engaged in positive contact and experienced less intergroup anxiety with international students also subsequently held more positive attitudes toward the international students. In another study, Shim et al. [5] tested whether parasocial contact between Korean university students and US nationals in the media supported the parasocial contact theory. They found that parasocial contact decreased the Korean students’ intergroup anxiety toward the Americans, which impacted their behavioral and affective attitudes [5]. Intergroup anxiety decreased particularly among students who did not have direct contact with the Americans. Intergroup anxiety is also often found in a mediating role in intergroup interactions; see e.g., [14], [15], [16]. For instance, intergroup anxiety has been found to be the key mediator of positive effects, such as reduced prejudice [17], [18] and a decrease in stereotypical

attitudes [19], [20]. Thus, giving students the chance to experience positive contacts with culturally and linguistically diverse individuals may be an effective way of teaching multiculturalism.

Intergroup anxiety relies on four aspects: personal characteristics, prior intergroup cognitions and attitudes, personal experiences, and situational factors [2]; see also [21]. Intergroup anxiety in turn affects the behaviors, cognitions, and affective reactions of the intergroup (parasocial) interaction parties [2], [21], [22], [23]. Interestingly, increased parasocial interaction in turn reduces intergroup anxiety [5]. Building on parasocial contact theory, we hypothesize that participation in both contact situations (IVE engagement and watching in 2D) will decrease intergroup anxiety:

H1: Intergroup anxiety will decrease after experiencing parasocial contact through engaging in the IVE or by watching the documentary in 2D.

3 Immersive virtual environments

Lee [24] states that parasocial processes are intensified with a viewer's sense of *immersion* in the mediated environment. However, IVEs' potential for decreasing negative outgroup feelings in the context of multicultural encounters is largely unexplored. This is surprising, as virtual reality (VR) has been referred to as "the ultimate empathy machine" [7]. For example, immersive news is often constructed in such a way that the viewer can "walk in someone else's shoes," for example a victim of war [25] or a homeless person [7], to evoke empathetic feelings in the viewer. We argue that empathy may also arise through being concerned for the other *as distinct* from oneself; see [26]. That is, positive regard can be evoked by engaging in an interpersonal contact or, even better, a relationship with the other in a mundane situation, such as a shared dinner.

Previous studies on VR indicate that the viewer's sense of presence is important in terms of immersion [27]. From an interpersonal perspective, a stronger sense of personal presence in an immersive environment also strengthens the perceived presence of the others "met" in the IVE—that is, social presence. In their early conceptualization, Short et al. [28, p. 65] define social presence as "the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationship." These notions underline the significance of interpersonal elements in IVEs.

Building on the implied potential of immersiveness for strengthening the interpersonal elements of mediated environments, we ask what differences can be found in terms of intergroup anxiety between those who experience parasocial contact through the IVE and those who watch the documentary in 2D. Liebers and Schramm [29] affirm that, in addition to comparing cultures, the different kinds of media contexts also need to be compared to better understand parasocial phenomena. The first research question therefore is:

RQ1: What differences related to intergroup anxiety can be found between engaging in the IVE and watching the 2D documentary?

4 Parasocial Relationship Formation

This study looked further into the interpersonal elements of the contact from the perspective of parasocial relationship formation. Pettigrew [30] claims it is crucial for participants to see “friendship potential” in the parasocial contact for it to have positive effects. Parasocial relationship formation [31], [32], [23] can be conceptualized through the viewer’s affective, cognitive, and behavioral responses to represented media characters [22]. Here, we focus on three interpersonal responses to parasocial contact, immediacy, homophily, and attraction, which have been found significant in previous studies [33], [3].

4.1 Immediacy

Presence and immediacy draw from the same fundament [34], [28], and researchers have used the terms interchangeably. In the current study, the character’s perceived presence in the encounter is operationalized as character immediacy because it more clearly focuses on the interpersonal communication behavior of the documentary character. Immediate communication signals relationship initiation [35], and communication scholars often consider it to be a precursor for liking [33], [36]. Immediacy can thus be seen as an indicator of the involvement and pleasantness of the communicator [37].

An early description of immediacy is provided by Mehrabian [38, p. 203], who views immediacy as communication behavior that enhances closeness to another person through nonverbal messages. In a review by Bartlett Ellis et al. [39], immediacy is characterized as an affect-based, multidimensional construct that, in contrast to Mehrabian’s [38] description, cannot be reduced to either nonverbal or verbal behaviors.

In educational contexts, teacher immediacy has been linked to learning outcomes, e.g., [40], [41], [42]. Perceptions of others’ immediacy can thus also be relevant in multicultural learning and in decreasing intergroup anxiety. However, studies investigating immediacy’s role in intergroup anxiety management are scarce. In fact, Bartlett Ellis et al.’s review [39] on immediacy found only one article in which immediacy and anxiety were scrutinized together. IVE studies have not considered immediacy as a defining element either, even though presence has often been found as a significant element.

Building on immediacy as a communicational element equivalent to the sense of presence, which in turn has been previously linked to the positive effects of IVEs, we ask whether those participants who experience a greater decrease in intergroup anxiety also perceive the documentary character as more immediate. The second research question is thus:

RQ2: What differences in the relationship between the level of intergroup anxiety and the level of perceived character immediacy can be found between engaging in the IVE and watching the 2D documentary?

4.2 Interpersonal attraction and perceived homophily

Attraction and homophily are both important elements in parasocial and intergroup interactions, and they predict more positive intergroup attitudes [43]. Perceived similarity and attraction are especially important elements of the relationship initiation stage and crucial for the parasocial interaction to proceed to a parasocial relationship [23]. Similarity or homophily has often been found to precede attraction. That is, people tend to like those they find similar to themselves. Attitude homophily in particular has been found significant in multicultural interactions, e.g., [43]. Furthermore, Turner [44] found attitude homophily to be the strongest predictor of parasocial interaction. Accordingly, social identity [e.g., how prone one is to expecting difficulties in interacting with the outgroup because of attitudinal differences] is also an important element that determines the level of intergroup anxiety [2].

Interpersonal attraction is generally considered an important element in generating positive responses to parasocial contact, e.g., [45]. It is a multidimensional construct that includes social, task, and physical attraction [46]. Typically, parasocial contact promotes social and task attraction, and then proceeds to parasocial interaction and a sense of the relationship's importance [47]. Schiappa et al. [3, p. 99] add that physical attraction may also play a role in enhancing attitude change through parasocial contact.

Based on the findings that link attraction and homophily to intergroup and parasocial phenomena, the third and final research question is:

RQ3: What differences in the relationship between the level of intergroup anxiety and the level of perceived homophily and interpersonal attraction can be found between engaging in the IVE and watching the 2D documentary?

5 Materials and methods

5.1 Participants and materials

The data were gathered in a medium-sized university in Finland at the end of 2019. Participants ($n = 50$) were recruited through advertisements on the university's notice boards, mailing lists, and face-to-face pitches before classes. There were 11 men and 39 women aged 19 to 49 ($M = 27.60$, $SD = 7.84$). All participants were university students of Finnish ethnicity, aside from one person of dual nationality (Finnish–Russian). The participants were asked to participate in a study on “video documentaries and their effects.” The study was conducted following the guidelines of the Finnish National Board on Research Integrity [48]. Informed consent was obtained in advance from all participants, and they were given a movie ticket as a reward for taking part.

Dinnertime360 is an immersive online storytelling platform, which has been designed for educational purposes. It includes the individual story worlds of four people. In the current study, a story about Muhammed was used. Muhammed is a Middle Eastern man living in Finland with his six-year-old daughter. In the IVE version, the viewer places him/herself at the same dinner table as Muhammed and his daughter in

Muhammed's living room. S/he navigates the living room and explores the surroundings, using a mouse on a 360-degree platform.

On the dinner table there are four icons that the viewer can click on with a mouse. Through one icon, the viewer can watch a video of Muhammed narrating his family's journey and life in Finland as refugees. The video is in English with Finnish subtitles. Another icon opens a short video in which Muhammed makes an okra dish. A third icon takes the viewer into a platform through which they can "make hummus" by moving the mouse to stir and add ingredients. Finally, an icon of VR headset offers a suggestion to watch a VR video by placing a mobile phone inside a VR headset. With the headset, the viewer can sit down at the dinner table in a stereoscopic, 360-degree video and watch Muhammed and his daughter on a sofa talking Arabic.

5.2 Procedures and equipment

Participants were randomly assigned to either engage in the IVE or watch the 2D version of the documentary. The even distribution of men and women in both groups was however ensured. In the IVE group ($n = 25$), there were six men and 19 women, aged 19 to 41 ($M = 26.84$, $SD = 6.50$). In the 2D group ($n = 25$), there were five men and 20 women, aged 20 to 49 ($M = 28.63$, $SD = 9.06$). The experiment was carried out in a soundproof studio. Participants first read an explanation of the study procedures. In the IVE group, participants were informed about possible nausea caused by VR headset and given the opportunity to watch the 2D version. Two participants opted to be in the 2D group.

Next, the participants filled in a pre-study questionnaire. In addition to demographic questions, they saw a picture of Muhammed, who later appeared in the documentary, and filled in the intergroup anxiety scale. After completion, they experienced parasocial contact with Muhammed by either engaging in the IVE or watching the documentary in 2D.

In the IVE condition, the participants navigated the platform and clicked all four icons. In the 2D condition, the participants only watched the story and the VR dinner table video in 2D (the video is also available in 360-degree video form; in this study, the control group watched it without moving the view). Thus, the added elements in the IVE condition were (1) the ability to navigate the dining area in a 360-degree image; (2) the ability to click icons at one's own pace and in one's chosen order; (3) two recipes for the dishes on the table; and (4) the stereoscopic, 360-degree form of the dinner table video.

After viewing the material, the participants answered the post-test questionnaire, including the scales outlined in Table 1. The experiment lasted from 30 to 60 minutes. The conditions were meant to match private user experiences. Thus, we showed the video on a 14-inch laptop and used inexpensive VR headset, which was operated by placing a mobile phone inside the headset. Sound was played through speakers on both sides of the participant, except when using the VR headset, when the sound came from headphones.

5.3 Measures

The questionnaire contained 144 items, including demographic questions and six open-ended questions². All scales were translated into Finnish using cross-translation. Scales used in this study measured the following variables: intergroup anxiety, nonverbal immediacy, generalized immediacy, homophily, and interpersonal attraction (see Table 1).

Table 1. Measures

Variable	Cronbach's alpha	Mean	SD	Scale
Intergroup anxiety (pre-test)	.84	39.66	9.59	11 items, 7-point scale (1-7)
Intergroup anxiety (post-test)	.87	28.60	9.37	11 items, 7-point scale (1-7)
Nonverbal immediacy	.86	97.10	8.95	26 items, 5-point scale (1-5)
Generalized immediacy	.74	22.58	3.24	4 items, 7-point scale (1-7)
Background homophily	.78	24.24	7.97	10 items, 7-point scale (1-7)
Attitude homophily	.90	62.36	12.20	15 items, 7-point scale (1-7)
Task attraction	.91	79.26	9.09	14 items, 7-point scale (1-7)
Social attraction	.92	63.70	10.68	12 items, 7-point scale (1-7)
Physical attraction	.91	59.44	10.24	12 items, 7-point scale (1-7)

Intergroup anxiety. Intergroup anxiety towards the documentary's character was measured using Stephan and Stephan's [21] measure. The scale includes 11 questions on a scale 1 to 7 about whether the respondent would feel certain, awkward, self-conscious, happy, accepted, confident, irritated, impatient, defensive, suspicious and careful, if he or she were to interact with the speaker. The scale has been widely used in studies scrutinizing different kinds of contact and minorities, e.g., [49], [5], [15], [12]. The scale was included in the pre- and post-test.

Immediacy. Perceived immediacy of the documentary's character was measured with two scales. Richmond et al.'s [33] Nonverbal Immediacy Scale's observer report version (NIS-O) was used to measure participants' perceptions of the character's non-verbal communication. In addition, a modified version of Andersen et al.'s [35] Generalized Immediacy scale (GI) was used. To fit the purposes of the study, the first five items of the scale were omitted. The items used included four adjectives (immediate/not immediate, cold/warm, unfriendly/friendly, close/distant) on a bipolar scale. The participants were provided with the definition of immediacy before answering the items. A similar version of the scale has been used successfully in a study by Isotalus and Muukkonen [50].

Perceived homophily. To measure the perceived homophily of the documentary's character, a scale of perceived homophily, originally developed by McCroskey et al. [51] and later improved by McCroskey et al. [52], was used. The original scale includes four dimensions: homophily of attitude, background, morality, and appearance. However, only background and attitude homophily scales were used as there is some doubt about the stability of the morality and appearance dimensions [52], [53].

² Open-ended questions and three scales are not reported in this study.

Interpersonal attraction. Interpersonal attraction to the documentary's character was measured with a scale originally developed by McCroskey and McCain [46] and later improved by McCroskey et al. [52]. The scale measures three dimensions of perceived attraction: social, task, and physical attraction.

6 Results

The Shapiro-Wilk test ($p > .05$) was utilized to assess the normality of distribution of investigated variables. Within the whole data set, all variables were distributed normally except post-test intergroup anxiety in the IVE group. Hence, the Mann-Whitney U test was used to analyze the difference in the variable between the IVE and 2D groups. As for testing differences among all other variables, a two-tailed t-test was used. Additionally, a one-tailed paired t-test was used to evaluate the decrease in intergroup anxiety. Data are presented as mean \pm standard deviation along with effect size (Cohen's d). Pearson's correlation was used to analyze the relationships between variables. P-values $< .05$ were considered statistically significant.

6.1 Decrease in Intergroup Anxiety

The first hypothesis (H1) predicted that intergroup anxiety would decrease after experiencing parasocial contact through engaging in the IVE or watching the documentary in 2D. In order to test this hypothesis, a paired samples t-test was conducted to compare the pre-test and post-test Intergroup Anxiety Scale. The results indicated that there was a significant difference between the scores of the pre-test ($M = 39.66$, $SD = 9.59$) and the post-test ($M = 28.60$, $SD = 9.37$); $t(49) = 10.60$, $p < .001$, $d = 1.15$. Thus, H1 was supported.

The first research question (RQ1) asked about the differences related to intergroup anxiety that can be found between engaging in the IVE and watching the 2D documentary. There was a difference, although not statistically significant, in the mean values of pre-test intergroup anxiety between the two groups (see Table 2). Therefore, a new variable "relative decrease in intergroup anxiety" was formulated. This variable depicts the percentage of decrease in intergroup anxiety of each individual. The average relative decrease in intergroup anxiety was larger within the IVE group ($M = 32.93$, $SD = 18.25$) than within the 2D group ($M = 22.31$, $SD = 13.6$); $t(48) = 2.33$, $p < .05$, $d = 0.66$. Additionally, a Mann-Whitney U test indicated that post-test intergroup anxiety was lower within the IVE group (Mdn = 24) than within the 2D group (Mdn = 34), $U = 179$, $p < .01$. In other words, experiencing parasocial contact through engaging in the IVE version of the documentary produced a larger decrease in intergroup anxiety than watching the 2D version.

Table 2. Mean differences between groups (IVE and 2D).

Variable	IVE group (n=25)		2D group (n=25)		<i>t</i>	Cohen's <i>d</i>
	Mean	SD	Mean	SD		
Pre-test Intergroup anxiety	38.08	9.58	41.24	9.52	-1.17	0.33
Post-test Intergroup anxiety**	25.16 ^a	8.74	32.04	8.84	-2.77	0.78
Relative decrease in Intergroup anxiety*	32.93	18.25	22.31	13.60	2.33	0.66
Nonverbal immediacy	97.44	8.51	96.76	9.55	0.27	0.08
Generalized immediacy	23.16	3.26	22.00	3.18	1.27	0.36
Background homophily	24.04	7.75	24.44	8.34	-0.18	0.05
Attitude homophily	64.44	11.49	60.28	12.75	1.21	0.34
Task attraction*	81.96	6.33	76.56	10.64	2.18	0.62
Social attraction	66.28	9.03	61.12	11.72	1.74	0.49
Physical attraction	61.12	8.93	57.76	11.33	1.16	0.33

Note. * $p < .05$. ** $p < .01$.

^aData was not normally distributed within IVE group, ^bData was not normally distributed within either group

6.2 Immediacy and Decrease in Intergroup Anxiety

The second research question (RQ2) inquired about the differences in the relationship between the level of intergroup anxiety and the level of perceived character immediacy that can be found between engaging in the IVE and watching the 2D documentary. Within the whole data set, the relative decrease in intergroup anxiety and perceived generalized immediacy were found to be moderately positively correlated ($r = .55, p < .001$). Additionally, a definite but small positive correlation was observed between the relative decrease in intergroup anxiety and perceived nonverbal immediacy ($r = .28, p < .05$).

The relationships between the variables show that the more immediate the behavior of the documentary's character was perceived to be, the greater the decrease in intergroup anxiety was. Within the IVE group, the relative decrease in intergroup anxiety correlated positively with both generalized immediacy ($r = .57, p < .01$) and nonverbal immediacy ($r = .29, p = .078$). With the latter, the correlation was not statistically significant. Within the 2D group, similar correlations for generalized immediacy ($r = .47, p < .01$) and nonverbal immediacy ($r = .28, p = .086$) were observed. These findings indicate that the positive relationship between the decrease in anxiety and generalized immediacy was stronger within the IVE group than within the 2D group. The Pearson correlations between variables are presented in Table 3 (both groups) and Table 4 (within each group).

Table 3. Correlations between variables (both groups, N = 50).

Variable	1	2	3	4	5	6	7	8
1. Relative decrease in Intergroup anxiety	-							
2. Nonverbal immediacy	.28*	-						
3. Generalized immediacy	.55***	.41**	-					
4. Background homophily	.07	-.002	-.02	-				
5. Attitude homophily	.34*	.16	.33*	.33*	-			
6. Task attraction	.29*	.07	.57***	.10	.47***	-		
7. Social attraction	.38**	.09	.50***	.21	.59***	.68***	-	
8. Physical attraction	-.07	.07	.23	.21	.34*	.53***	.45***	-

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4. Correlations between variables within groups (IVE and 2D).

Variable	1	2	3	4	5	6	7	8
1. Relative decrease in Intergroup anxiety	-	.28	.47*	.01	.19	.39	.28	-.03
2. Nonverbal immediacy	.29	-	.37	-.12	.09	.04	.12	.05
3. Generalized immediacy	.57**	.45*	-	-.17	.30	.66***	.61**	.37
4. Background homophily	.15	.15	.15	-	.10	.08	.18	.15
5. Attitude homophily	.42*	.23	.32	.63***	-	.48*	.62***	.47*
6. Task attraction	.04	.11	.43*	.17	.39	-	.76***	.62***
7. Social attraction	.40	.02	.32	.23	.51**	.43*	-	.71***
8. Physical attraction	-.23	.09	.01	.31	.11	.28	-.04	-

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

IVE group (n = 25) below diagonal; 2D group (n = 25) above.

6.3 Homophily and Attraction and Decrease in Intergroup Anxiety

The third research question (RQ3) inquired about the differences in the relationship between the level of intergroup anxiety and the level of perceived homophily and interpersonal attraction that can be found between engaging in the IVE and watching the 2D documentary. Pre-test intergroup anxiety correlated negatively with task attraction ($r = .45, p < .001$) and social attraction ($r = .47, p < .001$). Post-test intergroup anxiety, in turn, correlated negatively with attitude homophily ($r = .44, p < .01$), task attraction ($r = .55, p < .001$), and social attraction ($r = .60, p < .001$).

Within the IVE group, there was a positive correlation between perceived attitude homophily and the relative decrease in anxiety ($r = .42, p < .05$). In addition, within this group, the relative decrease in anxiety was also positively correlated with the level of social attraction, and negatively correlated with level of physical attraction, though this correlation was minor and non-significant. The relationships between the relative decrease in anxiety and both perceived background homophily and task attraction were non-existent. On the contrary, within the 2D group there was a positive correlation between task attraction and the relative decrease in anxiety ($r = .41, p < .05$), while the

relationship between attitude homophily and the relative decrease in anxiety was non-existent.

In sum, while the relative decrease in intergroup anxiety correlated positively with attitude homophily, task and social attraction, its relationship with the level of background homophily, and physical attraction was non-existent (see Table 3).

6.4 Additional Analyses: High Anxiety Sub-group

To further investigate the relationships between the given variables and intergroup anxiety as well as the differences between the IVE and 2D groups (RQs 1, 2, and 3), the data were divided in half according to the pre-test intergroup anxiety of participants. Two groups were formed: those with lower anxiety ($n = 26$) and those with higher anxiety ($n = 24$). As we focused on the differences between the IVE and 2D groups within these low/high anxiety groups, statistically significant differences were detected between the IVE and 2D groups within the high anxiety sub-group (hereafter HA-IVE and HA-2D).

An independent samples t-test indicated that scores on generalized immediacy were significantly higher for HA-IVE ($M = 23.60$, $SD = 2.07$) than for HA-2D ($M = 21.14$, $SD = 2.98$); $t(22) = 2.24$, $p < .05$, $d = 0.96$). In addition, perceived attitude homophily was significantly higher for HA-IVE ($M = 66.70$, $SD = 12.87$) than for HA-2D ($M = 55.71$, $SD = 8.94$); $t(22) = 2.48$, $p < .05$, $d = 0.99$. Also, task attraction was significantly higher for HA-IVE ($M = 75.50$, $SD = 5.38$) than for HA-2D ($M = 67.86$, $SD = 8.14$); $t(22) = 2.59$, $p < .05$, $d = 1.11$. Relative decrease in intergroup anxiety was significantly greater for HA-IVE ($M = 38.15$, $SD = 19.45$) than for HA-2D ($M = 21.48$, $SD = 13.77$); $t(22) = 2.48$, $p < .05$, $d = 0.99$. Similar differences were not observed between the low anxiety IVE and 2D groups. These results suggest that the IVE documentary evoked stronger perceptions of immediacy, attitude homophily and task attraction and a greater relative decrease in intergroup anxiety, especially when the participants' pre-test intergroup anxiety was above average.

7 Discussion

This study examined the potential of parasocial contact in an immersive virtual environment (IVE) called Dinnertime360 for decreasing intergroup anxiety among university students and the interpersonal elements connected to any such effect. Our study demonstrates the potential of IVEs in multicultural learning among university students.

We hypothesized that experiencing parasocial contact with an outgroup member, either through engaging in Dinnertime360 as an IVE or watching similar content as a 2D documentary, would decrease intergroup anxiety. The study found that both conditions did decrease anxiety, but the decrease was greater among participants who engaged in the IVE. Thus, it appears that the added elements of the IVE, such as stereoscopic and 360-degree views, generated a stronger response. Note that, for example, the amount of the character's self-disclosure remained the same in both situations.

The result is interesting, as there has been some doubt about the actual benefits of immersiveness per se, in terms of generating positive responses; for review, see [54]. Sundar et al. [55] have, for example, suggested that, when the content of a documentary is highly emotional, the technological features may matter less in generating a sense of presence. In other words, they suggest that immersion is created through the events and story featured in the audiovisual material. However, Dinnertime360 used in this study included the documentary character's revelation of highly emotional issues, such as death and financial hardship, which remained the same in both conditions (IVE and 2D). Even so, the IVE version resulted in a greater decrease in intergroup anxiety. Thus, the results of this study suggest that immersiveness, as conceptualized here, can add value to audiovisual materials intended to provide an intense interpersonal experience of parasocial contact. Here, immersiveness was composed of the ability to explore and interact with the IVE and experience "the dinner table situation" in VR. Thus, in Dinnertime360's immersive version, the students were active participants, rather than passive spectators.

The results also showed that participants who (1) scored higher in the intergroup anxiety pre-test and (2) engaged in IVE showed a greater relative decrease in intergroup anxiety. The result complements previous studies indicating that, for example, individuals with a higher need for cognitive closure benefit most from contact interventions because of lowered anxiousness [56]. IVEs may be especially beneficial for those students who experience high intergroup anxiety, that is, students who do not have multicultural contacts and lack the opportunity to engage in multicultural encounters such as student exchanges. Thus, specific immersive platforms could be designed for adult students with both high anxiety and little opportunity to interact with individuals whose cultural background differs from theirs.

Based on the results, two elements were particularly significant in the IVE: general immediacy and attitude homophily. The modified version of the General Immediacy (GI) scale showed moderate correlation with the average decrease in intergroup anxiety in both groups. This relationship was stronger for the IVE viewers. Interestingly, a similar relationship was not found between anxiety and nonverbal immediacy, measured by the Nonverbal Immediacy Scale-Observer Report (NIS-O). In other words, the scales appeared to measure two different things: the thing measured by the modified GI scale was relevant in terms of decreasing intergroup anxiety, whereas the NIS-O was not. Next, we attempt to shed light on the differing results and the relevant construct captured with the GI scale in the context of this study.

NIS-O focuses on observations of the other's communication, whereas the modified GI focuses more on the *relational closeness* between the interactants. Bartlett Ellis et al. [39] state that immediacy is not limited to nonverbal communication, but instead is an affect-based construct. The intergroup anxiety scale used in this study also emphasizes the affective side of intergroup anxiety [2]. Therefore, it may be that general immediacy as an affect-based construct resonated particularly well with intergroup anxiety as an affect-based outcome variable. Hasler et al. [57] also point out that IVEs appear to specifically generate more affect-based, implicit viewer responses than cognitive ones.

This implies that IVEs may be especially beneficial in generating further positive responses toward outgroup members by evoking more relationship-oriented perceptions that operate on the affective side of the human psyche than traditional 2D representations. In an IVE, the viewer's focus is shifted from observing the character's communication to the possibility of their emerging relationship, that is "the friendship potential" [30] of the character. This perspective also includes the viewer's experience of themselves as present and *in relation* to the other in the interactional setting of the IVE. Thus, through providing a more powerful, emotionally engaging experience of "meeting" an outgroup member, IVEs may strengthen the effects of parasocial contact.

The importance of presence has been demonstrated in several VR studies, e.g., [58], [55]; for a meta-analysis, see [27]; yet this study sheds light on the concept's interpersonal inducements. Indeed, we encourage researchers to look into immediacy separately from social presence, as immediacy is more clearly a relational concept. As Short et al. [28, p. 73] state, immediacy may vary, even when social presence remains the same.

Our results imply that the interpersonal routes to decreased anxiety in IVEs and 2D documentaries also follow two separate paths. For those watching the 2D version, a stronger perception of task attraction was connected to decreased anxiety, which is in line with previous studies, e.g., [47], [3]. However, for the IVE viewers, attitude homophily was significantly connected to decreased intergroup anxiety. In other words, for those who engaged in the immersive documentary, it was more important to share similar attitudes with Muhammed in order to experience less intergroup anxiety than to find him attractive in task-related issues. It is noteworthy that Muhammed differs in several ways from most of the study's participants: Muhammed is a middle-aged, Middle Eastern single father and an immigrant to Finland. Participants in this study were Finnish-born university students mostly in their twenties. Furthermore, 78% of the participants identified as women. Thus, in the IVE condition, the participants, although demographically different, found attitudinal similarities with Muhammed that decreased their intergroup anxiety.

Tukachinsky and Stever [23] see homophily as especially significant in the experimentation stage of parasocial relationship development [see also 44]. Similarly, Liu et al. [43] found attitude homophily to be a significant element of initial multicultural interactions among university students. Thus, one explanation may be that those students who engaged in the IVE proceeded further in the interpersonal and parasocial relationship formation than those who saw the 2D version. Interestingly, Powell et al. [59] found homophily, especially attitude homophily, to be positively related to ratings of (teacher) immediacy. Thus, if immersion in the IVE enhanced perceptions of character immediacy, it could have generated increased perceptions of homophily. Perceived homophily, in turn, has been found to predict parasocial interactions [44], intergroup interactions [43], and positive viewer attitudes [60]. Accordingly, when looking at the potential of IVEs in multicultural learning and parasocial contacts, the two most interesting elements seem to be the synergy between relational immediacy and perceived homophily.

The present study has limitations. First, our sample size of 50 students was relatively small. However, the small sample size allowed great control over the experiment.

Second, we conceptualized immersiveness as the technological features of the IVE platform. We accept that the extra elements constituting immersiveness can also be seen as additional content. Even so, the extra elements allowed the viewer to interact with the IVE instead of passive viewing and thus, from our perspective, essentially constitute immersiveness. Future studies should focus on the experience of immersion to further understand the exact technological features significant to the interpersonal aspects of IVEs. Finally, we modified the GI scale for the purposes of this study, which in itself challenges the original concept of generalized immediacy. Future studies should further investigate the phenomenon revealed here. Relevant constructs may include, for instance, relational communication and measures of parasocial interaction.

To summarize, the results of this study imply that immersiveness has the potential to enhance interpersonal elements of parasocial contact. The decrease in intergroup anxiety specifically is important in the context of multicultural learning because it has been found to positively correlate with more generalized outgroup attitudes; for review, see [2]. Accordingly, when students experience fewer negative feelings toward multicultural contacts, they are more likely to engage in face-to-face multicultural interactions in their subsequent studies and future career. In conclusion, IVEs provide a promising tool for developing multicultural competence among adult students.

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9 References

- [1] R. L. Pope, A. L. Reynolds, and J. A. Mueller, Eds.. *Multicultural Competence in Student Affairs: Advancing Social Justice and Inclusion*. John Wiley & Sons, Incorporated, ProQuest Ebook Central, 2019. [E-book]
- [2] W. G., Stephan, " Intergroup anxiety: Theory, research, and practice," *Personality and Social Psychology Review*, vol. 18, no. 3, pp. 239–255, 2014. <https://doi.org/10.1177/1088868314530518>
- [3] E. Schiappa, P. Gregg, and D. Hewes, "The parasocial contact hypothesis," *Communication Monographs*, vol. 72, no. 1, pp. 92–115, 2005. <https://doi.org/10.1080/0363775052000342544>
- [4] E. Schiappa, P. Gregg, and D. Hewes, " Can one TV show make a difference? Will & Grace and the parasocial contact hypothesis," *Journal of Homosexuality*, vol. 51, no. 4, pp. 15–37, 2006. https://doi.org/10.1300/J082v51n04_02
- [5] C. Shim, Y.B. Zhang, and J. Harwood, "Direct and mediated intercultural contact: Koreans' attitudes toward U.S. Americans," *Journal of International and Intercultural Communication*, vol. 5, no. 3, pp. 169–188, 2012. <https://doi.org/10.1080/17513057.2012.670715>
- [6] J. Blascovich, J. Loomis, A. Beall, K. Swinth, C. Hoyt, and J. N. Bailenson, "Immersive virtual environment technology as a methodological tool for social psychology,"

- Psychological Inquiry*, vol. 13, no. 2, 103–124, 2002.
https://doi.org/10.1207/S15327965PLI1302_01
- [7] F. Herrera, J. Bailenson, E. Weisz, E. Ogle, and J. Zaki, “Building long-term empathy: A large-scale comparison of traditional and virtual reality perspective-taking,” *PLoS ONE*, vol. 13, no. 10, e0204494, 2018. <https://doi.org/10.1371/journal.pone.0204494>
- [8] A. van Loon, J. Bailenson, J. Zaki, J. Bostick, and R. Willer, “Virtual reality perspective-taking increases cognitive empathy for specific others,” *PLoS ONE*, vol. 13, no. 8, pp. 1–19, 2018. <https://doi.org/10.1371/journal.pone.0202442>
- [9] M. North, J. Hill, A. Aikhuele, and S. North, “Virtual Reality Training in Aid of Communication Apprehension in Classroom Environments,” *International Journal Of Emerging Technologies In Learning (IJET)*, vol. 3, no. 2, pp. 34-37, 2018.
<http://dx.doi.org/10.3991/ijet.v3i2.163>
- [10] K. Stavroulia, and A. Lanitis, “Enhancing Reflection and Empathy Skills via Using a Virtual Reality Based Learning Framework,” *International Journal Of Emerging Technologies In Learning (IJET)*, vol. 14, no. 07, pp. 18-36, 2019.
<http://dx.doi.org/10.3991/ijet.v14i07.9946>
- [11] M. Sattar, S. Palaniappan, A. Lokman, N. Shah, U. Khalid, and R. Hasan, “Motivating Medical Students Using Virtual Reality Based Education,” *International Journal Of Emerging Technologies In Learning (IJET)*, vol. 15, no. 02, pp. 160-174, 2020.
<http://dx.doi.org/10.3991/ijet.v15i02.11394>
- [12] A. Voci, and M. Hewstone, “Intergroup contact and prejudice toward immigrants in Italy: The mediational role of anxiety and the moderational role of group salience,” *Group Processes & Intergroup Relations*, vol. 6, no. 1, pp. 37–54, 2003.
<https://doi.org/10.1177/1368430203006001011>
- [13] A. S. Mak, P. M. Brown, and D. Wadey, “Contact and Attitudes Toward International Students in Australia: Intergroup Anxiety and Intercultural Communication Emotions as Mediators,” *Journal of Cross-Cultural Psychology*, vol. 45, no. 3, pp. 491–504, 2014.
<https://doi.org/10.1177/0022022113509883>
- [14] R. N. Turner, M. Hewstone, and A. Voci, “Reducing explicit and implicit outgroup prejudice via direct and extended contact: The mediating role of self-disclosure and intergroup anxiety,” *Journal of Personality and Social Psychology*, vol. 93, no. 3, pp. 369–388, 2007.
<https://doi.org/10.1037/0022-3514.93.3.369>
- [15] E. P. Visintin, A. Voci, L. Pagotto, and M. Hewstone, “Direct, extended, and mass-mediated contact with immigrants in Italy: Their associations with emotions, prejudice, and humanity perceptions,” *Journal of Applied Social Psychology*, vol. 47, no. 4, pp. 175–194, 2017. <https://doi.org/10.1111/jasp.12423>
- [16] C. Wang, F. Huang, and L. Vezzali, “A test of positive and negative extended intergroup contact in a Chinese minority with perceived group norms and intergroup anxiety as mediators,” *Journal of Applied Social Psychology*, vol. 49, pp. 399–408, 2019.
<https://doi.org/10.1111/jasp.12532>
- [17] L. Pagotto, A. Voci, and V. Maculan, “The effectiveness of intergroup contact at work: Mediators and moderators of hospital workers' prejudice towards immigrants,” *Journal of Community & Applied Social Psychology*, vol. 20, pp. 317–330, 2010.
<https://doi.org/10.1002/casp.1038>
- [18] A. Voci, and M. Hewstone, “Intergroup contact and prejudice toward immigrants in Italy: The mediational role of anxiety and the moderational role of group salience,” *Group Processes & Intergroup Relations*, vol. 6, no. 1, pp. 37–54, 2003.
<https://doi.org/10.1177/1368430203006001011>

- [19] G. Byrd, Y. Zhang, and A. Gist-Mackey, "Interability contact and the reduction of interability prejudice: Communication accommodation, intergroup anxiety, and relational solidarity," *Journal of Language and Social Psychology*, vol. 38, pp. 441–458, 2019. <https://doi.org/10.1177/0261927X19865578>
- [20] L. Vezzali, D. Giovannini, and D. Capozza, "Longitudinal effects of contact on intergroup relations: The role of majority and minority group membership and intergroup emotions," *Journal of Community and Applied Social Psychology*, vol. 20, pp. 462–479, 2010. <https://doi.org/10.1002/casp.1058>
- [21] W. G. Stephan, and C. V. Stephan, "Intergroup anxiety." *Journal of Social Issues*, vol. 41, no. 3, pp. 157–175, 1985. <https://doi.org/10.1111/j.1540-4560.1985.tb01134.x>
- [22] H. Schramm, and T. Hartmann, "The PSI-process Scales: A new measure to assess the intensity and breadth of parasocial processes," *Communications*, vol. 33, no. 4, pp. 385–401, 2008. <https://doi.org/10.1515/COMM.2008.025>
- [23] R. Tukachinsky, and G. Stever, "Theorizing development of parasocial engagement," *Communication Theory*, vol. 29, no. 3, pp. 297–318, 2018. <https://doi.org/10.1093/ct/qty032>
- [24] K. M. Lee, "Presence, explicated," *Communication Theory*, vol. 14, no. 1, pp. 27–50, 2004. <https://doi.org/10.1111/j.1468-2885.2004.tb00302.x>
- [25] N. S. Schutte, and E. J. Stilić, "Facilitating empathy through virtual reality," *Motivation and Emotion*, vol. 41, no. 6, pp. 708–712, 2017. <https://doi.org/10.1007/s11031-017-9641-7>
- [26] C. D. Batson, K. Sager, E. Garst, M. Kang, K. Rubchinsky, and K. Dawson, "Is empathy-induced helping due to self–other merging?" *Journal of Personality and Social Psychology*, vol. 73, pp. 495–509, 1997. <https://doi.org/10.1037/0022-3514.73.3.495>
- [27] J. J. Cummings, and J. N. Bailenson, "How immersive is enough? A meta-analysis of the effect of immersive technology on user presence," *Media Psychology*, vol. 19, pp. 272–309, 2016. <https://doi.org/10.1080/15213269.2015.1015740>
- [28] J. Short, E. Williams, and B. Christie, B. *The social psychology of telecommunications*. London: John Wiley & Sons, 1976.
- [29] N. Liebers, and H. Schramm, "Parasocial interactions and relationships with media characters – An inventory of 60 years of research," *Communication Research Trends*, vol. 38, no. 2, pp. 4–31, 2019.
- [30] T. F. Pettigrew, "Intergroup contact theory," *Annual Review of Psychology*, vol. 49, no. 1, pp. 65–85, 1998. <https://doi.org/10.1146/annurev.psych.49.1.65>
- [31] D. C. Giles, "Parasocial interaction: A review of the literature and a model for future research," *Media Psychology*, vol. 4 no. 3, pp. 279–305, 2002. https://doi.org/10.1207/S1532785XMEP0403_04
- [32] H. Schramm, H. and W. Wirth, "Testing a universal tool for measuring parasocial interactions across different situations and media: Findings from three studies," *Journal of Media Psychology: Theories, Methods, & Applications*, vol. 22, no. 1, pp. 26–36, 2010. <https://doi.org/10.1027/1864-1105/a000004>
- [33] V. P. Richmond, J. C. McCroskey, and A. E. Johnson, "Development of the nonverbal immediacy scale (NIS): Measures of self- and other-perceived nonverbal immediacy," *Communication Quarterly*, vol. 51, pp. 502–515, 2003. <https://doi.org/10.1080/01463370309370170>
- [34] C. N. Gunawardena, "Social presence theory and implications for interaction and collaborative learning in computer conferences," *International Journal of Educational Telecommunications*, vol. 1, no. 2/3, pp. 147–166, 1995.

- [35] J. F. Andersen, P. A. Andersen, P. A. and A. D. Jensen, "The measurement of nonverbal immediacy," *Journal of Applied Communications Research*, vol. 7, no. 2, pp. 153–180, 1979. <https://doi.org/10.1080/00909887909365204>
- [36] V. P. Richmond, and J. C. McCroskey, "The impact of supervisor and subordinate immediacy on relational and organizational outcomes," *Communication Monographs*, vol. 67, no. 1, pp. 85–95, 2000. <https://doi.org/10.1080/03637750009376496>
- [37] J. K. Burgoon, and B. A. LePoire, "Nonverbal cues and interpersonal judgments: Participant and observer perceptions on intimacy, dominance, composure and formality," *Communication Monographs*, vol. 66, pp. 105–123, 1999. <https://doi.org/10.1080/03637759909376467>
- [38] A. Mehrabian, A. "Some referents and measures of nonverbal behavior," *Behavior Research Methods and Instrumentation*, vol. 2, no. 6, pp. 205–207, 1969. <https://doi.org/10.3758/BF03208096>
- [39] R. J. Bartlett Ellis, A. F. Carmon, and C. Pike, "A review of immediacy and implications for provider-patient relationships to support medication management," *Patient Preference & Adherence*, vol. 10, pp. 9–18, 2016. <https://doi.org/10.2147/PPA.S95163>
- [40] M. D. Dixon, M. R. Greenwell, C. Rogers-Stacy, T. Weister, and S. Lauer, "Nonverbal immediacy behaviors and online student engagement: Bringing past instructional research into the present virtual classroom," *Communication Education*, vol. 66, no. 1, pp. 37–53, 2017. <http://dx.doi.org/10.1080/03634523.2016.1209222>
- [41] Q. Zhang, J. G. Oetzel, X. Gao, R. G. Wilcox, and J. Takai, "Teacher immediacy scales: Testing for validity across cultures." *Communication Education*, vol. 56, 2. 2, pp. 228–248, 2007. <https://doi.org/10.1080/03634520601089092>
- [42] L. Zhu, and D. Anagondahalli, "Predicting student satisfaction: The role of academic entitlement and nonverbal immediacy," *Communication Reports*, vol. 31, no. 1, pp. 41–52, 2018. <https://doi.org/10.1080/08934215.2017.1364777>
- [43] N. Liu, Y. B. Zhang, and W. T. Wiebe, "Initial communication with and attitudes toward international students: Testing the mediating effects of friendship formation variables," *Journal of Intercultural Communication Research*, vol. 46, no. 4, pp. 330–345, 2017. <https://doi.org/10.1080/17475759.2017.1344999>
- [44] J. R. Turner, "Interpersonal and psychological predictors of parasocial interactions with different television performers," *Communication Quarterly*, vol. 41, no. 4, pp. 443–453, 1993. <https://doi.org/10.1080/01463379309369904>
- [45] J. Knoll, H. Schramm, C. Schallhorn, and S. Wynistorf, S. "Good guy vs. bad guy – The influence of parasocial interactions with media characters on brand placement effects," *International Journal of Advertising: The Review of Marketing Communications*, vol. 34, pp. 720–743, 2015. <https://doi.org/10.1080/02650487.2015.1009350>
- [46] J. C. McCroskey, and T. A. McCain, "The measurement of interpersonal attraction," *Speech Monographs*, vol. 41, no. 3, pp. 261–266, 1974. <https://doi.org/10.1080/03637757409375845>
- [47] R. B. Rubin, R. B. and M. P. McHugh, "Development of parasocial interaction relationships," *Journal of Broadcasting and Electronic Media*, vo. 31, no. 3, pp. 279–292, 1987. <https://doi.org/10.1080/08838158709386664>
- [48] TENK (Finnish National Board on Research Integrity), "The ethical principles of research with human participants and ethical review in the human sciences in Finland," *Publications of the Finnish National Board on Research Integrity TENK*, 3/2019. [Online] Available: https://www.tenk.fi/sites/tenk.fi/files/Ihmistieteiden_eettisen_ennakkoarviointin_ohje_2019.pdf. [Accessed: Mar. 15, 2021]

- [49] S. C. Bagci, Z. E. Piyale, and E. Ebcim, "Imagined contact in high conflict settings: The role of ethnic group identification and the perspective of minority group members," *Journal of Applied Social Psychology*, vol. 48, pp. 3–14, 2018. <https://doi.org/10.1111/jasp.12485>
- [50] P. Isotalus, and H. Muukkonen, "Animated agent immediacy and news services with handheld computers," *Communication Quarterly*, vol. 50, no. 1, pp. 78–92, 2002. <https://doi.org/10.1080/01463370209385647>
- [51] J. C. McCroskey, V. P. Richmond, and J. A. Daly, "The development of a measure of perceived homophily in interpersonal communication," *Human Communication Research*, vol. 1, no. 4, pp. 323–332, 1975. <https://doi.org/10.1111/j.1468-2958.1975.tb00281.x>
- [52] L. L. McCroskey, J. C. McCroskey, and V. P. Richmond, "Analysis and improvement of the measurement of interpersonal attraction and homophily," *Communication Quarterly*, vol. 54, no. 1, pp. 1–31, 2006. <https://doi.org/10.1080/01463370500270322>
- [53] R. B. Rubin, P. Palmgreen, and H. E. Sypher, *Communication research measures: A sourcebook*, New York: Routledge, 2009.
- [54] M. T. Lanier, F. Waddell, M. Elson, D. J. Tamul, J. D. Ivory, and A. Przybylski, "Virtual reality check: Statistical power, reported results, and the validity of research on the psychology of virtual reality and immersive environments," *Computers in Human Behavior*, vol. 100, pp. 70–78, 2019. <https://doi.org/10.1016/j.chb.2019.06.015>
- [55] S. S. Sundar, J. Kang, and D. Oprean, "Being there in the midst of the story: How immersive journalism affects our perceptions and cognitions," *Cyberpsychology, Behavior, and Social Networking*, vol. 20, no. 11, pp. 672–682, 2017. <https://doi.org/10.1089/cyber.2017.0271>
- [56] K. Dhont, A. Roets, and A. Van Hiel, "Opening closed minds: The combined effects of intergroup contact and need for closure on prejudice," *Personality and Social Psychology Bulletin*, vol. 37, pp. 514–528, 2011. <https://doi.org/10.1177/0146167211399101>
- [57] B. Hasler, G. Hirschberger, T. Shani-Sherman, and D. Friedman, "Virtual peacemakers: Mimicry increases empathy in simulated contact with virtual outgroup members," *Cyberpsychology, Behavior and Social Networking*, vol. 17, no. 12, pp. 766–771, 2014. <https://doi.org/10.1089/cyber.2014.0213>
- [58] W. Park, H. Heo, S. Park, and J. A. Kim, "Study on the Presence of Immersive User Interface in Collaborative Virtual Environments Application," *Symmetry*, vol. 11, no. 4, pp. 476, 2019. <https://doi.org/10.3390/sym11040476>
- [59] L. Powell, T. Hamilton, M. Hickson, and J. Stuckey, "The relationship of homophily to verbal and nonverbal immediacy in the classroom," *Communication Research Reports*, vol. 18, no. 3, pp. 217–222, 2001. <https://doi.org/10.1080/08824090109384801>
- [60] M. Pfau, "A channel approach to television influence," *Journal of Broadcasting and Electronic Media*, vol. 34, no. 2, pp. 195–214, 1990. <https://doi.org/10.1080/08838159009386736>

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