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Gaming for peace: Virtual contact through cooperative video gaming increases children's intergroup tolerance in the context of the Israeli–Palestinian conflict

Joy Benatov[a,b,*], Rony Berger[c,d], Carmit T. Tadmor[e]

[a] Department of Special Education, University of Haifa, Israel
[b] Department of Psychology, College of Management and Academic Studies, Israel
[c] The Center for Compassionate Mindful Education, Israel
[d] Bob Shapell School of Social Work, Tel Aviv University, Israel
[e] Coller School of Management, Tel Aviv University, Israel

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ABSTRACT

The effects of virtual cooperative video games have not yet been explored within the setting of hostile intergroup contexts; nor have they been tested among school-aged children. We present results from a longitudinal school-based intervention that enabled virtual contact between Jewish-Israeli and Palestinian-Israeli children. The program included six virtual and two face-to-face sessions. We find that relative to an intragroup contact control group, children who participated in the intergroup program showed reduced intergroup bias on both cognitive and emotional indicators, including reduced stereotypical views, negative emotions and discriminatory tendencies toward members of the other ethnic group, as well as increased willingness to engage in social contact with outgroup members. These effects were long lasting and preserved six months after termination of the program. The intervention's effectiveness was consistent across measures, gender, and ethnic groups. Thus, the program we developed offers a feasible, relatively cost-effective gaming intervention that can be applied even in areas characterized by severe ethnic tension and hostile conflict.

1. Introduction

Minecraft is a virtual sandbox game in which players can cooperatively shape an environment by crafting and building constructions out of pixelated cubes. A kind of virtual Lego, it quickly captured the imaginations of millions of people worldwide, with over 40 million monthly players and over 144 million copies sold, making it the second best-selling video game of all time (Horti, 2018; Maiberg, 2016). Can this child-friendly favorite pastime be used as an effective tool to increase intergroup tolerance among children in the context of the intractable Israeli-Palestinian conflict?

Only a few studies have been conducted to test whether cooperative video games may be used to reduce intergroup bias (e.g., Adachi, Hodson, Willoughby, Blank, & Ha, 2016; Adachi, Hodson, Willoughby, & Zanette, 2015; Stiff & Bowen, 2016; Vang & Fox, 2014; Velez, Mahood, Ewoldsen, & Moyer-Gusé, 2014). Although their results are encouraging, these studies were limited to one-time laboratory experiments conducted with undergraduate student samples, measuring their impact on intergroup attitudes toward students from rival universities, avatars, or confederates. Consequently, it is unclear whether the benefits of cooperative video games would be strong enough to influence attitudes toward members of ethnic or religious groups with whom significant levels of animosity exist, especially between members of groups living under an extreme protracted conflict. In fact, Adachi et al. (2015) suggested that in contexts of extreme conflict such as between Palestinians and Israelis, this kind of intervention could be less effective in reducing bias than it would be in the context of less hostile relations. It is further unknown whether the effects would last beyond the intervention sessions, nor whether cooperative video games would generally reduce intergroup bias in children (Adachi et al., 2016; Adachi & Willoughby, 2017). Both these questions are of critical importance. First, with no research investigating the long-term effects of virtual contact interventions, there is no way to assess whether the intervention is actually useful. A time-limited reduction in prejudice is by no means the mark of a successful intervention, particularly in the context of an ongoing violent ethnic conflict. Second, previous research suggests that school-aged children are more developmentally amenable to prejudice reduction interventions than are older populations, due to

* Corresponding author at: Department of Special Education, University of Haifa, Israel.
E-mail address: jbentov2@gmail.com (J. Benatov).

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the permeability of prejudice development at this age (e.g., Cameron, Alvarez, Ruble, & Fuligni, 2001; Granic & Patterson, 2006; Raabe & Beelmann, 2011). Hence, if we can develop a long-lasting intervention that could turn children more socially tolerant, there is hope they could grow up to be more socially tolerant adults.

In the present research, we sought to address these gaps by testing the immediate and six-month follow-up efficacy of a cooperative multiplayer Minecraft intervention that involved mixed virtual teams of Jewish-Israeli and Palestinian-Israeli children. The main focus of our research is on comparing the efficacy of virtual contact—with cooperative video gaming as a tool—to reduce prejudice between members of groups living in intractable conflict situations, with the only difference among conditions being whether children carry out the tasks with outgroup members or ingroup members. In what follows, we briefly summarize intergroup contact theory, which comprises the theoretical underpinning for the video game intervention (Allport, 1954; Pettigrew & Tropp, 2006). Then, we review existing research on computer-mediated intergroup contact interventions in general and cooperative video games in particular as tools to increase intergroup tolerance across virtual space. Thereafter, we outline the limitations of previous video game intervention studies and describe the more elaborate "Play2Talk" intervention we tested among Jewish and Palestinian Israeli elementary school students. Finally, we evaluate the efficacy of this intervention in inducing greater intergroup tolerance using both cognitive and emotional indicators.

1.1. Intergroup contact as a prejudice reduction intervention

Prejudice and stereotyping have profound adverse effects on children's educational, social, physical, and psychological wellbeing, including poor school achievement, low self-esteem, health and behavioral problems, difficulties in interpersonal relationships, social exclusion, and generally compromised social-emotional growth (Berger, Brenick, & Tarrasch, 2018; Inzlicht, Tullett, Legault, & Kang, 2011; Rutland & Killen, 2015; Schmitt, Branscombe, Postmes, & Garcia, 2014). Consequently, social, developmental, and educational psychologists have devoted a great deal of effort to develop prejudice reduction programs for children and youth, with varying degrees of success (see, Aboud et al., 2012; Beelmann & Heinemann, 2014; Berger, Benatov, Abu-Raiya, & Tadmor, 2016; Lemmer & Wagner, 2015).

Although several theoretical models underlie prejudice reduction programs, Allport's (1954) intergroup contact model has been the most widely applied and studied approach. A testimony to this is a meta-analysis conducted by Pettigrew and Tropp (2006) that identified 515 studies utilizing 713 independent samples and over 250,000 individuals on which the contact model had been tested. The contact model is derived from intergroup contact theory and rests on the fundamental assumption that if people have the opportunity for mutual acquaintance and communication, they are more likely to understand and accept each other (Allport, 1954; Miller & Brewer, 1984). Originally, this model postulated that under optimal conditions, face-to-face contact between groups can be effective in reducing negative intergroup attitudes and prejudices (Allport, 1954; Pettigrew, 1998). These conditions include: (a) equal status between groups, (b) common goal for both groups, (c) intergroup cooperation between the groups, and (d) support of the contact by authorities. Pettigrew (1998) added a fifth criterion; namely, cross-group friendships that last beyond formal contact programs. A recent meta-analysis has shown that cross-group friendships are especially powerful forms of intergroup contact (Davies, Tropp, Aron, Pettigrew, & Wright, 2011). Nevertheless, empirical studies have demonstrated that intergroup contact that does not adhere to all these conditions can also reduce intergroup prejudice, though to a lesser degree (Pettigrew & Tropp, 2006).

Despite these promising effects, interventions based on direct contact are limited in two critical ways. First, the beneficial tolerance effects of face-to-face interaction with members of another cultural group appear to be stronger on affective indicators of intergroup bias, such as emotional responses to a group, than on cognitive indicators such as stereotypes and prejudicial attitudes (e.g., Berger, Brenick, Lawrence, Coco, & Abu-Raiya, 2018; Tadmor, Hong, Chao, Wiruchnipawan, & Wang, 2012; for a review, see Tropp & Pettigrew, 2005a; Tropp & Pettigrew, 2005b). This outcome has been suggested to result from the inherently emotional nature of the personal contact experiences with outgroup members, where the match between the emotional component of the experience and the emotional component of the attitudes measured increases the likelihood of finding a strong effect on affective rather than cognitive measures (e.g., Dovidio, Brigham, Johnson, & Gaertner, 1996; Millar & Tesser, 1986). Second, conducting contact-based interventions between members of opposing groups is challenging and not always feasible. Indeed, contact can be implemented only when people have the opportunity to actually meet members of the other group (Crisp, Stathi, Turner, & Husnu, 2009; Phinney, Ferguson, & Tate, 1997; Turner, Hewstone, Voci, & Vonofakou, 2008). In many contexts, especially in the context of a protracted and ongoing intergroup conflict, such opportunities are in very limited supply. Furthermore, some prejudice researchers (Maoz, 2004; Salomon, 2004) have raised serious doubts regarding the efficacy of contact interventions in reducing prejudice and improving intergroup relations in situations of protracted ethno-political conflict. In fact, several studies have shown that intercultural contact experiences can lead to a worsening of prejudicial attitudes and stereotyping, especially under threatening or mentally depleting circumstances (Barlow et al., 2012; Paolini, Harwood, & Rubin, 2010; Tadmor, Hong, Chao, & Cohen, 2018; Vorauer & Sasaki, 2011).

Due to these limitations, in the last two decades contact theory has been extended to include not only direct face-to-face contact interventions, but also indirect contact interventions. These interventions refer to programs that utilize indirect contact, including extended contact (e.g., learning that an ingroup member is friends with an outgroup member, Cameron & Rutland, 2006; Wright, Aron, McLaughlin-Volpe, & Ropp, 1997), vicarious contact (e.g., observing an ingroup member interact with an outgroup member, Schiappa, Gregg, & Hewes, 2005); imagined contact (e.g., imagining oneself interacting with an outgroup member, Crisp & Turner, 2009; Husnu & Crisp, 2010), multicultural experience contact (e.g., exposing oneself to non-personal elements of outgroup culture, Tadmor, Berger, Brenick, Abu-Raiya, & Benatov, 2017; Tadmor et al., 2012) and para-social contact (positive media portrayals of intergroup relationships; Brenick, Henning, Killen, O'Connor, & Collins, 2007). Recently, research has begun to explore the potential effects of computer-mediated contact (e.g., interacting with an outgroup member via a computer-based communication system, Amichai-Hamburger, Hasler, & Shani-Sherman, 2015). A growing body of work has demonstrated the advantages of indirect contact, including an alleviating effect on cognitive indicators of intergroup bias (Dovidio, Eller, & Hewstone, 2011; Tadmor et al., 2012; Tadmor et al., 2017; Turner et al., 2008; Wright et al., 1997).

1.2. Computer-mediated intergroup contact

Computer-mediated contact in particular provides several valuable advantages in addition to the more general advantages of indirect contact. For example, although contact and communication are mediated by a computer, virtual contact can still enable immediate two-way interactions between outgroup members; it is independent of geographical distance, and language barriers can be bridged using technological software (Amichai-Hamburger & McKenna, 2006; Walther, 2009). And yet, an even more critical advantage involves the relatively reduced emotional nature of the virtual contact context, which may consequently make the cognitive aspects of the contact experience more accessible, yielding strong positive effects on cognitive indicators of social tolerance, in addition to emotional indicators. Indeed, virtual game-playing contact could be less emotional than regular face-to-face

contact for two main reasons. First, given that contact can occur in familiar surroundings (e.g., through one's home or school computer), it may be less threatening and may evoke less anxiety than face-to-face contact with unknown outgroup members would, since the latter was generally found to be mentally depleting experience (Apfelbaum, Sommers, & Norton, 2008; Paolini, Hewstone, & Cairns, 2007; Richeson & Trawalter, 2005; Stephan & Stephan, 1985). Second, compared to face-to-face contact, computer-mediated contact may not only provide fewer cues to indicate status differences, but it is also considered a leaner mode of communication, in which people form impressions of each other based on the limited information that is conveyed in writing (e.g., Walther, 2009). Consequently, computer-mediated contact is expected to evoke weaker emotions and make the cognitive aspects of the contact experience more accessible, thereby increasing the likelihood of obtaining effects on both affective and cognitive indicators of prejudice (Dovidio, Esses, Beach, & Gaertner, 2002; Millar & Tesser, 1986; Paolini et al., 2007; Tadmor et al., 2012; Wright et al., 1997).

Several studies have empirically supported the potential advantages of computer-mediated contact interventions for reducing prejudice (Alvidrez, Pineiro-Naval, Marcos-Ramos, & Rojas-Solis, 2015; Cao & Lin, 2017; Schumann, Klein, Douglas, & Hewstone, 2017; Schwab, Sagioglou, & Greitemeyer, 2019; Tavakoli, Hatami, & Thorngate, 2010; Walther, Hoter, Ganayem, & Shonfeld, 2015; White, Abu-Rayya, Bliuc, & Faulkner, 2015). For example, Tavakoli et al. (2010) followed Canadian and Iranian undergraduate students who exchanged messages and photos via email over the course of seven weeks, and found that virtual contact decreased negative attitudes and stereotyping while increasing positive attitudes and knowledge about outgroup culture. Schwab et al. (2018) conducted a correlational study showing that the amount of virtual Facebook contact experienced by Iranian and Israeli adult participants pre-selected for belonging to the Facebook pages of “Israel-Loves-Iran” and “Iran-loves-Israel” communication campaigns correlated with having more positive outgroup emotions. Walther et al. (2015) found that Arabs and Jews who used chat forums and text-based discussion boards demonstrated reduced prejudice against the outgroup during a yearlong online course. Cao and Lin (2017) examined Mainland Chinese attitudes toward Hong-Kongers and found that whereas video-based communication improved attitudes toward a targeted Hong-Konger, text-based communication produced improved attitudes toward the entire group. Finally, using a mixed design of internet-based weekly chat-room and e-mail sessions, a workshop conducted by experts trained in mediation, and two-day face-to-face meetings, Yablon and Katz (2001) found that Jewish-Israeli high-school students adopted more favorable attitudes toward Bedouin-Israelis, though Bedouin-Israelis' attitudes toward Jewish-Israeli remained unchanged due to a ceiling effect.

Following this line of investigation, scholars have suggested that video games played online may similarly provide an advantageous platform for contact between youth of different social groups. Indeed, video games are highly popular among young people and are often played with additional players from different social and ethnic groups (Lenhart et al., 2008; Mancini, Caricati, Balestrieri, & Sibilla, 2018). Whereas previous intergroup studies have focused mainly on the computer-mediated communication aspect of online contact, researchers focusing on video games have highlighted the cooperative elements of playing together to reach a common goal (e.g., Adachi et al., 2016). In line with predictions, the few studies conducted thus far have successfully demonstrated that video games played cooperatively can have a positive effect on outgroup bias (Adachi et al., 2015; Adachi et al., 2016; Stiff & Bowen, 2016; Vang & Fox, 2014; Velez et al., 2014). For example, Stiff and Kendra (2018) conducted a one-shot experiment that showed improved attitudes toward a member of a rival university after participants played a virtual game with an outgroup university member than when participants were playing the game alone. Stiff and Bowen (2016) showed that playing a cooperative low-involvement video game with a trivial outgroup member led to more positive attitudes toward the outgroup member than playing competitively or alone. Behm-Morawitz, Pennell and Gerding Speno (2016) demonstrated that virtual embodiment via a digital gaming app, with White participants embodying Black Avatars, can help reduce prejudicial beliefs measured immediately after playing. Adachi et al. (2016) showed that Canadian undergrads who cooperatively played a video game for 12 min with American students boosted positivity of outgroup attitudes, regardless of the degree of game violence. Recategorization (e.g., feeling a psychological connection with outgroup members) accounted for this effect. Finally, Velez et al. (2014) showed how cooperative video-game playing for 15 min with a confederate posing as student from a rival university increased helping behavior and reduce aggression toward outgroup members.

1.3. The present research

Nonetheless, despite the apparent efficacy of cooperative video-game playing in improving intergroup relations, existing studies were conducted in one-shot laboratory settings rather than under real-life conditions and focused mainly on outgroups highlighted for the purpose of the study rather than real-world outgroups against which a significant level of animosity exists. Moreover, the intolerance-reducing potential of cooperative video-game playing has been tested neither in the context of social groups living in extreme protracted conflict, nor on children. Furthermore, no study has specifically evaluated the differential impact on both emotional and cognitive indicators of intergroup bias. Our study tests whether the child-friendly favorite pastime of virtual cooperative gaming can serve as an effective tool to increase intergroup tolerance among children being raised within the context of the intractable Israeli-Palestinian conflict. Specifically, to address these gaps by encouraging communication and cooperation between Jewish-Israeli and Palestinian-Israeli elementary-school children, we partnered with the nongovernmental organization “Games for Peace” to develop the “Play2Talk” program. “Play2Talk” utilizes the Minecraft video game because it is a non-violent game that is highly popular among youth worldwide, with strong appeal to both male and female players (up to 40% of the game's users are female, Skipper, 2016). The program involved the creation of mixed teams (Palestinian and Jewish students) that collaborated in six computer-mediated meetings (and two face-to-face meetings) in order to win points and to construct the most creative structure. Given the combination of mainly virtual contact with some direct-contact experiences, we predicted positive benefits of the intervention for both emotional and cognitive indicators of intergroup bias. We measured stereotyping, negative emotions, prejudicial attitudes, and willingness to interact with each group toward the other at three time points: a week before, immediately after, and six months after termination of the program, with results compared to groups who underwent a similar program but engaged in virtual play and contact with ingroup members only.

We hypothesized that the hybrid “Play2Talk” program would reduce both emotional and cognitive indicators of stereotyping and prejudicial attitudes between Israeli-Jewish and Israeli-Palestinian children. We further expected the program's effect to withstand six months after termination.

2. Method

2.1. Setting

The “Play2Talk” program was implemented from December 2016 until November 2017 in two elementary schools, one Israeli-Palestinian and one Israeli-Jewish, in the northern Israeli city of Haifa. The context in which these two schools are situated deserves a brief description.

Since the establishment of the State of Israel in 1948, the relationship between Jewish-Israelis and Palestinian-Israelis has experienced ups and downs and is strongly influenced by the general Israeli-

Palestinian conflict (Kelman, 1998). Both Jewish-Israelis and Palestinian-Israelis hold negative views and stereotypes toward each other. Jewish-Israelis tend to perceive Palestinian-Israelis as violent, cruel, untrustworthy, primitive, or dirty (e.g. Bar-Tal, 1996; Cohen, 1985), while Palestinian-Israelis perceive Jewish-Israelis as exploitative, untrustworthy and racist (Smooha, 1987). Haifa is one of the few mixed cities in Israel today, with a total population of 270,300 people, of which 90% are Jewish-Israelis and the rest Palestinian-Israelis. The two populations are quite segregated in their own communities. Jewish-Israeli and Palestinian-Israeli children, for the most part, attend different schools though both groups attend public schools under the Israel Ministry of Education. Public schools in the Jewish sector teach in Hebrew and offer in addition to the regular curriculum classes in Jewish history, religion and culture, whereas public schools in the Palestinian sector teach in Arabic and offer a curriculum that emphasizes Arab history, religion and culture.

Despite high tension between the Palestinian and Jewish populations in Israel, residents of Haifa have succeeded to maintain amicable relationships until the outbreak of hostilities and frequent terror attacks during the Second Intifada (i.e., Palestinian uprising). Since then, tensions have risen and relationships between these populations gradually deteriorated. A survey conducted during the period of the study revealed that over half of Israeli-Palestinians in 2017 do not accept Israel as a Jewish and democratic state – a significant reduction when compared to the 2015 figures (Smooha, 2018). Further deterioration in the relationship between these groups occurred in January 2017 (in the midst of the program), when a Palestinian resident of Haifa killed one Jewish resident and severely injured another (Bachner, 2018).

Prior to implementation, the program was approved by both the Ministry of Education and our university's Human Research Ethics Committee. It was then presented to the education department of the Haifa municipality that subsequently presented the program to the 41 elementary schools (32 Jewish and 9 Arab schools) in the region. Of the 14 Jewish schools and the five Arabic schools that expressed interest in participating in the program, one school from each of the sectors was chosen for the study because these two schools served students of similar socio-economic status (i.e., both schools served a middle-class population).

The program was implemented with 6th grade students because children of this age level are well acquainted with video games and are relatively amenable to reducing prejudicial attitudes (Doyle & Aboud, 1995). Each school had two 6th grade classesGiven the limited capacity of “Games to Peace” to conduct the “Play2Talk” program among all the 6th grade students and the insistence of the principals to include students from the two classes at each of the schools, half of each class was randomly chosen (by lottery) to participate in the “Play2Talk” program (the experimental group), whereas the other half of each class participated in a similar computer activity without the intergroup interaction element (control group). Furthermore, it was decided that “Games for Peace” would implement the “Play2Talk” program with students in the control group during the following academic year, conditioned upon funding. Thus, during the study period, students took part either in the “Play2Talk” intervention program or in a Minecraft Computer Activity (MCA) control program.

2.2. Participants

Overall, 95 6th-grade students were included in the initial study but only 89 students were included in the analysis. Of the six students who were removed (2 from the experimental group and 4 from the control group), two left the school due to family relocation and four did not fully complete the questionnaires. Of the remaining 89 students, 46 participated as part of the Play2Talk program (experimental group) and 43 students were assigned to the MCA control program. Of the participants in the experimental group, 52.5% were females and 50% were Jewish (the rest were Palestinian-Israeli). Of the participants in the control group, 50.4% were females and 51.1% were Jewish (the rest were Palestinian-Israeli). Notably, Adachi et al. (2016) conducted a power analysis for repeated-measures analysis of variance (RMANOVA), which revealed that for their analysis, an N of 68 was required to attain an effect size of partial $\eta^2 = 0.05$. In actuality, they found a larger value of partial η^2 for the effect of intergroup video-game cooperation on outgroup attitudes, suggesting that although our sample size was not large, it was sufficient to detect potential effects of the intervention.

2.3. Procedure

After obtaining support from the schools' principals, the program's rationale was introduced to the two homeroom teachers from each school. The teachers were given explanations and instructions regarding their various roles in preparing their students to participate in the program and supervising them during the sessions. The teachers then presented the program to the students' parents and enlisted their support for it. Parents were also asked to sign written consent forms for their children's participation. Throughout the program, computer game experts that developed the customized Minecraft environment for the program accompanied the virtual sessions. They administered the Minecraft environment and, as such, helped the homeroom teachers to supervise and monitor the activities of the participants during the sessions. These assistants were responsible for altering the homeroom teachers of any offensive behaviors and helping to terminate such activity. Notably, in actuality, no offensive intergroup behaviors were reported and there was only a single attempt to interfere with the opposing groups' structure, but it yielded no impact on either the game or study results.

2.4. The games for peace experimental intervention

The “Play2Talk” program was comprised of six “virtual” 90-min sessions in which students played a video game together from their schools' computer rooms. For these virtual sessions, the Minecraft video game environment was specifically customized in order to encourage cooperation between the players and enable fluent online writing communication. Moreover, certain precautions were built in to reduce the potential for aggressive or violent behavior. For example, the virtual world was monitored constantly to ensure that a safe gaming environment was maintained. Though a fair number of Israeli-Palestinian students know Hebrew, the system automatically translated the chat messages into Arabic or Hebrew via the Microsoft translator to ensure the flow of written chat communication between the two groups during the virtual sessions. Preceding the virtual meetings, a preparation workshop lead by a gaming expert was held for each class, presenting the intended program, its rationale, and its schedule. Students in the experimental group were told they were going to participate in a special program that will enable them to play video games together with children from a Palestinian or Jewish school, respectively, from their city.

In each virtual session, the two experimental classes, each from its own school computer room, logged in simultaneously to a shared game world. Each session had a main task assignment (see Table 1 for the program's outline and see Pictures 1 and 2 for examples). In the first session, students were provided with the opportunity to get acquainted with the virtual environment of the game. From the second session on, students were divided into intergroup teams, each composed of half Jewish and half Palestinian students. The teams were arranged in growing numbers of team members. Thus, in the second session, teams were comprised of two randomly assigned students, making up a total of 23 pairs. In the third session, 11 teams of four members each were randomly assigned from the previously-assigned pairs. In the fifth through seventh sessions, two groups of 23 members were randomly assigned from the teams of fours created in session 3. The two teams

Table 1
General Sessions Contents for the Experimental Group – "Play2Talk" Program.

Session	Assignment
1 (90 min)	Getting to know the virtual environment of Minecraft – Getting acquainted with the game. Each player plays alone, but players from the other ethnic group are present in the environment, communication between players is possible.
2 (90 min)	Escape Room – Teams of two players, one player from each ethnic group. Team members need to cooperate and communicate in order to find cues and get out of the escape room in minimal time.
3 (90 min)	Scavenger Hunt - Teams of four players, half from each ethnic group. Teams learn to mine, accumulate resources and build structures in an open island.
4 (180 min)	Getting to know each other – Face-to-face meeting. Teams of four, half from each ethnic group. Teams play some fun games together (finding common words in both Hebrew and Arabic, building a structure from plastic cups, ropes and stick, solving large puzzles).
5(90 min)	Rebuild the Village – Two teams each of 23 players. Each team is spawned on an island from the Scavenger Hunt class, and needs to mine resources and rebuild the islands damaged structures.
6 (90 min)	Creative Building – Each of the two teams from the previous session start to plan and build a new structure.
7(90 min)	Continue Creative Building – teams continue the project from the previous session and finalize their structures.
8 (180 min)	Bidding farewell – Final face-to-face meeting. Sharing experiences from the previous meetings and reflecting on the future.

Fig. 1. A screen shot from session 6 showing the process of building creative structures.

Fig. 2. A screen shot from session 7 showing a final structure built by one of the teams.

faced a series of challenges and tasks constructed so as to require an increasing level of communication and cooperation between the players within each team in order to win points. Students could communicate via the game's chat system as well as through additional social media platforms outside the game. Furthermore, the game world was open once a week for after-school play sessions, and the children were encouraged to take part and carry on with "bonus" challenges after school. (See Figs. 1 and 2.)

In addition to the virtual sessions, a preparatory workshop took place in each of the schools, and two face-to-face encounters were held. Notably, we decided to include the two face-to-face meetings given the powerful impact that direct contact has on reducing emotional

indicators of intolerance (Pettigrew & Tropp, 2006). Nonetheless, we decided to conduct such meetings only after the third virtual session and at the end of the program because past research has demonstrated that despite the utility of direct contact for intergroup tolerance, intergroup meetings have the potential to increase the anxiety of the participants significantly, particularly in situations where there is an ongoing conflict and animosity between the two ethnic groups (Paolini et al., 2010; Yablon & Katz, 2001). Thus, we first sought to establish a playful and cooperative atmosphere between members of the two groups, and only then to introduce them in a face-to-face meeting. As a result, the first face-to-face meeting was held during the fourth session. It was aimed to further familiarize the students with their playmate counterparts. The Jewish students hosted the Palestinian students at their school, prepared a small show for them, played social games with them, and gave them small gifts. The second face-to-face meeting was held at the Palestinian school, intended to celebrate the end of the project and announce winners in the competition. In this session, the Palestinians prepared a small show for their guests, played social games with them, and gave them small gifts. The students presented the final Minecraft products, and winners were announced. Notably, both Palestinian and Jewish parents attended the last face-to face meeting.

2.5. Control group - minecraft computer activity

Students in the control group attended computer activity classes for an equal amount of time as did those in the intervention group. During their computer classes, they followed the same six stages that the students from the experimental group went through, as well as collected points and competed between groups. The main difference was that they played with students from their own class. As in the experimental condition, the gaming expert was available for questions and assistance during the sessions.

2.6. Measures

We included as dependent variables a combination of emotional, cognitive, and behavioral indicators of intergroup tolerance. We also included a measure of negative ingroup stereotyping, but in line with previous research (Adachi et al., 2016), we did not expect it to have an effect. Notably, each of these measures was assessed at three different time (T) points: T1 = pre-intervention, T2 = post-intervention, and T3 = 6-month follow-up. These measures have been used previously with the two ethnic groups and have demonstrated measurement equivalence for the multi-item dependent measures (e.g., Berger, Abu-Raiya, & Gelkopf, 2015). We reported all measures, interventions, and exclusions that occurred.

2.6.1. Emotional prejudice

Following Teichman, Bar-Tal, and Abdolrazeq (2007), we measured the degree to which the students experience six different emotions (i.e., anxiety, hate, apathy, understanding, threat, and fondness) toward members of the other ethnic group. Items were scored on five-point Likert scale ranging from 0 (do not feel at all) to 4 (feel to a very large degree). Positive emotions (i.e., understanding and fondness) were reverse scored. Higher scores on this scale indicate stronger negative emotions toward members of the other ethnic group. This scale has been found valid in previous studies with Jewish and Palestinian students (Berger, Brenick, & Tarrasch, 2018). Cronbach's coefficients for this scale were acceptable: 0.86, 0.91, and 0.91 for the pre-intervention, post-intervention, and follow-up surveys, respectively.

2.6.2. Positive and negative characteristics

To assess positive and negative characteristics of outgroup members, we used an open-ended question in which participants were asked to write in their own words as many characteristics as they could that represent the outgroup members. The self-generated characteristics were categorized into positive and negative adjectives and then summed to form two variables: positive characteristics and negative characteristics.

2.6.3. Negative stereotyping

To assess stereotyping, we used a measure developed by Kaminsky and Bar-Tal (1996). Students were asked to rate ten bipolar traits (i.e., industrious-lazy, smart-stupid, courageous-cowered, educated-uneducated, generous-cheap, nonviolent-violent, clean–dirty, honest-dishonest, loyal-disloyal, civilized-primitive) for both their own ethnic group and the other group, measured on a five-point scale. Higher scores indicated higher negative stereotyping of the other. Scores were then averaged across all questions for each ethnic group, generating two variables: outgroup stereotyping and ingroup stereotyping. This scale has been found valid across different ethnic groups in previous studies (Berger et al., 2015). Notably, our main stereotyping variable of interest was outgroup stereotyping. Following Adachi et al. (2015), we did not predict an effect on in-group stereotyping. Cronbach's alpha were 0.96, 0.97, 0.97 and 0.96, 0.96, 0.97 for the outgroup and ingroup scales, respectively, at pre-intervention, post-intervention, and follow-up.

2.6.4. Negative behavioral expectations

Following Berger, Brenick, Lawrence, et al. (2018), participants were asked about the likelihood that a member of the other ethnic group who moved into their neighborhood would exhibit the following behaviors: (1) ignore you; (2) join you; (3) do things to bother you (e.g., loud noise, litter); (4) help you if you need it; (5) insult you; (6) talk to you respectfully; (7) physically fight with you; (8) protect you from other children. Answers were rated on a 5-point Likert scale ranging from 1 (no chance at all) to (5) (a very high chance). Positive behavioral interactions were reversed scored, such that higher scores indicated more negative behavioral expectations. The scale has been used in previous studies with Jewish and Palestinian students (Berger, Brenick, & Tarrasch, 2018). Cronbach's coefficients for this scale were 0.75, 0.87, and 0.89 for the pre-intervention, post-intervention, and follow-up surveys, respectively.

2.6.5. Willingness for social contact

Using a scale developed in previous studies (e.g., Bar-Tal & Labin, 2001; Teichman et al., 2007), willingness to interact was assessed by asking participants to indicate the extent to which they would be willing to perform eight activities (chat online, meet with, live next to, study with, invite to one's house, be a guest in the other's home, live as neighbors, be a friend, and be in a relationship) with members of the other ethnic group on a five-point scale ranging from 1 (not at all) to 5 (to a very great extent). Higher scores on this scale indicated greater readiness to engage in social contact with members of the other ethnic group. This scale has been found valid across different ethnic groups in previous studies (Berger, Gelkopf, Heineberg, & Zimbardo, 2016). Cronbach's coefficients were 0.91, 0.95, and 0.95 for the pre-intervention, post-intervention and follow-up surveys, respectively.

2.6.6. Actual contact

To measure contact with outgroup members, participants were asked a single item asking them how often they interacted with members from the other ethnic group. Answers were rated on a 5-point Likert scale ranging from 1 (very rarely) to 5 (constantly). Due to the low frequency of reported actual contact, this measure was transformed to be binary, such that 0 was very rare contact and any value above that was coded as 1.

2.6.7. Control variables

We also collected data on several potential moderators of the intervention's effectiveness, including: gender, amount of time spent weekly playing Minecraft, extent of enjoyment playing Minecraft, and

strength of ethnic identity which we measured using two items "I have a strong sense of belonging to the Jewish/Palestinian people" and "I feel Jewish/Palestinian." Answers were rated on a five-point Likert scale ranging from 1 (greatly agree) to 5 (greatly disagree). Higher scores on this scale indicated weaker sense of ethnic identity. Cronbach's alpha for this scale was 0.91.

3. Analysis

First, descriptive statistics for all the dependent variables at baseline (prior to the intervention) were calculated. Independent sample t-tests were performed to determine whether any differences existed at baseline between the experimental and control groups on all dependent measures. In addition, independent sample t-tests were conducted to compare between the two ethnic groups (Israeli Palestinians and Jews) on all measured variables at baseline. These preliminary analyses were aimed at getting a general picture of prejudice levels displayed in the current sample prior to the intervention.

Second, as part of the main analysis, to examine the intervention's effect on intergroup bias levels over time, and because data in this study had a nested structure (i.e., measurements along three time-points that were nested within each participant, with participants were nested within pairs and pairs within quadruplets), multilevel (4 levels) modeling techniques were used for data analysis. Models were fitted at Level 1 (i.e., at the within-participant level), for outcomes at T1 (pre-intervention), T2 (post intervention), and T3 (6 months follow-up). For each outcome being modeled, fixed effects included one coefficient for time, one coefficient for condition, and one coefficient to represent the time by condition interaction. To test our hypotheses, we used the GLIMMIX procedure of SAS© Version 9.4, which fits statistical models with nonindependence of observations, allowing for either a normal or non-normal distribution of the dependent variable. Because positive characteristics and negative characteristics were count variables (i.e., counting of events variables), which had only nonnegative integer values with excess amount of zeros, a negative-binomial model was used for these measures (Gardner, Mulvey, & Shaw, 1995; Greene, 1994). The binary outcome (actual contact) was modeled with a logistic distribution.

For each outcome, we used the same dependency structure. In order to account for within-participant dependency, while allowing for different variances at T1, T2, and T3, an unstructured covariance structure was specified for the three errors associated with the same subject. Random intercepts were specified at the pair level to account for the clustering within pairs, and at the quadruplet level to account for the clustering within quadruplets. Due to numerical problems while fitting the model for the binary dependent variable, we replaced the unstructured covariance structure that was specified for the three errors associated with the same subject, by random intercept at subject level, which implies a compound symmetry covariance structure at the subject level. Given that the covariance structure might differ between treatment and control participants, we allowed for different variance and covariance parameters for treatment and control groups (using the GROUP option of GLIMMIX).

Our interest was in the change from baseline within each intervention group, and differences between intervention groups and times for each outcome. All these post-hoc comparisons were conducted using appropriate LSMEANS commands of GLIMMIX applied to the outcome models. LSMEANS are the estimated values of the dependent variable, under specified values of the explanatory variables, which are time and group (and their interaction) in our analysis. GLIMMIX also provides inference regarding the differences between the LSMEANS, such that in our analysis, we can infer whether there are significant differences between the various combinations of time and groups. We further applied the step-down Bonferroni method of Holm (1979) for p-value adjustments to control the familywise error rate for the collection of tests included in each type of analysis.

Finally, accounting for our relatively small sample size, the empirical sandwich estimator was used in our analysis because it produces valid standard errors asymptotically, even if the covariance structure is mis-specified. Moreover, given that the classical sandwich estimator (Huber, 1967; White, 1980) is biased, we used the HC3, which is one of the bias-corrected sandwich estimators available in the GLIMMIX SAS 9.4 procedure. Following O'Kelly and Ratitch (2014), the GLIMMIX HC3 sandwich estimator is recommended for small sample sizes and is a reasonable option for all cases, even when the sample size is large.

Notably, to estimate the effect sizes in predicting the six outcomes, we used two different estimates. First, we calculated partial eta squared (partial η^2) for treatment*time interaction. Partial eta squared was computed from the F-value and its degrees of freedom, as described in Lakens' (2013) Eq. 13:

$$n^2{}_p \frac{F \times df_{effect}}{F \times df_{effect} + df_{error}} \tag{13}$$

Second, we used formula 26 of Nakagawa and Schielzeth (2013) to calculate pseudo R^2. Given that we considered only "group," "time," and "group*time" as fixed effects, R^2 calculates their power to explain the outcomes. For all these outcomes, the change in R^2 between models with and without treatment effects (group and group*time) was calculated. Significance of the difference between these two R^2 values was calculated by testing the contrast in the full model and deleting the two components concerning group effects (group and group*time).

4. Results

4.1. Preliminary analyses

At baseline (during the pre-intervention phase), independent-sample t-tests were conducted to determine whether there were any significant differences between the experimental and the control group before the intervention regarding all dependent measures. No such differences were found, neither among Jews (all p's $>$ 0.418) nor among Palestinians (all p's $>$ 0.305). Therefore, no corrections for baseline means had to be made. Moreover, the design of the study included random participant assignment to groups, with an equal number of participants included in each group. Tables 4–9 report information about the means and SDs of all variables at T1 (pre intervention).

Interestingly, when comparing the Jewish-Israeli and Palestinian-Israeli children within the experimental and control conditions, results from independent-sample t-tests revealed some differences. Specifically, within the experimental condition, we found that Jewish-Israelis were more emotionally prejudiced against Palestinian-Israelis ($t(38) = 2.114$, $p = .041$, Cohen's $d = 0.67$), they had marginally more negative behavioral expectations from interacting with Palestinian-Israelis ($t(38) = 1.746$, $p = .089$, Cohen's $d = 0.55$) and they had significantly less contact with members of the other group ($t(38) = -5.169$, $p < .001$, Cohen's $d = 1.63$). In addition, Jewish-Israelis held significantly more negative stereotypes of Palestinian-Israelis ($t(33) = 5.972$, $p < .001$, Cohen's $d = 1.89$) and significantly less negative stereotypes of Jewish-Israelis ($t(27) = -6.016$, $p < .001$, Cohen's $d = 1.90$). Similarly, within the control condition, we found that Jewish-Israelis had greater emotional prejudice against Israeli-Palestinians ($t(42) = 2.765$, $p = .008$, Cohen's $d = 0.84$) and significantly less contact with members of the other group ($t(42) = -6.043$, $p < .001$, Cohen's $d = 1.83$), though not more negative behavioral expectations ($t(38) = 0.852$, $p = .399$). In addition, Jewish-Israelis held significantly more negative stereotypes of Palestinian-Israelis ($t(33) = 6.032$, $p < .001$, Cohen's $d = 1.84$) and significantly less negative stereotypes of Jewish-Israelis ($t(42) = -6.239$, $p < .001$, Cohen's $d = 1.90$). Nonetheless, given that as reported above, no significant difference were found between experimental and control groups at T1, we proceeded to conduct the main

Table 2
Multilevel analysis results for: (1) emotional prejudice against outgroup; (2) positive characteristics of outgroup; (3) negative characteristics of outgroup; (4) negative outgroup stereotyping; (5) negative behavioral expectations of outgroup; (6) willingness for social contact with outgroup; and (7) Actual contact with outgroup.†

Measure	Effect	F	p	partial η^2
(1) Emotional prejudice against outgroup				
	Group	10.25**	0.002	0.048
	Time	5.37**	0.005	0.050
	Group X Time	35.42***	< 0.0001	0.258
Pseudo R^2 = 0.14				
(2) Positive characteristics of outgroup				
	Group	11.12**	0.001	0.052
	Time	0.98	0.38	0.001
	Group X Time	16.23***	< 0.0001	0.137
Pseudo R^2 = 0.11				
(3) Negative characteristics of outgroup				
	Group	6.47*	0.012	0.031
	Time	1.95	0.145	0.019
	Group X Time	5.25**	0.006	0.049
Pseudo R^2 = 0.19				
(4) Negative outgroup stereotyping				
	Group	9.22***	0.002	0.043
	Time	10.18***	< 0.0001	0.091
	Group X Time	18.87***	< 0.0001	0.156
Pseudo R^2 = 0.13				
(5) Negative behavioral expectations of outgroup				
	Group	13.03***	0.0004	0.060
	Time	7.93**	0.0005	0.072
	Group X Time	14.91***	< 0.0001	0.128
Pseudo R^2 = 0.21				
(6) Willingness for social contact with outgroup				
F		19.49***	< 0.0001	0.087
P value		9.17**	0.0002	0.082
Partial eta square		25.54***	< 0.0001	0.200
Pseudo R^2 = 0.20				
(7) Actual contact with outgroup				
F		0.15	0.70	0.001
P value		3.02	0.06	0.047
Partial eta square		0.83	0.44	0.013

Note. Group = intervention vs. control. Estimates for count variables are on log scale.
† p < .10.
* p < .05.
** p < .01.
*** p < .001.

analyses.

4.2. Main analyses

For our main analysis, results from the multi-level modeling reported in Table 2 revealed a significant interaction of group X time for all variables except for the single-item measure of actual contact. Specifically, the group X time interaction effect was significant for: (1) emotional prejudice against outgroup; (2) positive characteristics of outgroup, (3) negative characteristics of outgroup; (4) negative outgroup stereotyping; (5) negative behavioral expectations; and (6) willingness for social contact with outgroup.

As an example, for the dependent variable of emotional prejudice against outgroup, Table 2 shows that despite the significant main effect for group ($F(1,204) = 10.25$, $p = .002$ partial $\eta^2 = 0.048$) as well as for time ($F(2,204) = 5.37$, $p < .0053$, partial $\eta^2 = 0.050$), these effects were qualified by the predicted significant group X time interaction ($F(2,204) = 35.42$, $p < .0001$, partial $\eta^2 = 0.258$). Moreover, pseudo $R^2 = 0.136$ surpassed the cutoff of 0.13, which according to Cohen's (1988) estimates is considered a medium effect size.

As a next step, we conducted a post-hoc analysis to probe the significant interaction (group X time). Means and SD across the three time periods for intervention and control are presented in Table 3(a). In

Table 3
(a) Means and SDs for T1 (pre intervention), T2 (post intervention), T3 (6 months follow up); and (b) post hoc comparisons for emotional prejudice against outgroup across time points.*

(a)

Measure	T1 (pre)	T2 (post)	T3 (follow up)
Emotional prejudice against outgroup	M (SD)	M (SD)	M (SD)
Intervention	1.65 (0.12)	1.12 (0.12)	1.08 (0.11)
Control	1.78 (0.16)	2.01 (0.19)	2.01 (0.17)

(b)

	Comparison of Time A to Time B		Estimate	t value (df = 204)	p value (Stepdown Bonferroni correction)
	Time A	Time B			
Intervention	1	2	0.52	7.33***	< 0.0001
Intervention	1	3	0.56	5.51***	< 0.0001
Intervention	2	3	0.04	0.67	1.0
Control	1	2	−0.23	−4.26**	0.001
Control	1	3	−0.23	−4.79***	0.0001
Control	2	3	0.01	0.13	1.0

Note. Recall that for the treatment condition, we predicted significant differences between T1 and T2, and between T1 and T3 but no difference between T2 and T3. The direction of the change was aligned with the scaling of the measure. In contrast, we predicted no differences between times in the control condition. When differences were found in the control condition, they were in fact in the direction of increased social intolerance.
* p < .05.
** p < .01.
*** p < .001.

Table 3(b), post-hoc analysis reveals that the intervention was effective in significantly decreasing the degree of negative emotional prejudice against the outgroup both between T1 and T2 (T1 mean = 1.65, SD = 0.12 to T2 mean = 1.12, SD = 0.12, p < .0001) as well as between T1 and T3 (T1 mean = 1.65, SD = 0.12 to T3 mean = 1.08, SD = 0.11, p < .0001) with no significant difference between (T2 to T3: p = 1.0), suggesting that even six months after the intervention, it was successful in maintaining lower levels of emotional prejudice against the outgroup relative to T1. In contrast, no decrease in emotional prejudice was found in the control group. In fact, potentially due to the above-mentioned murder that occurred during the intervention period, emotional prejudice seemed to have increased in the control group from T1 to T2 (T1mean = 1.78, SD = 0.16 to T2mean = 2.01, SD = 0.19, p = .001) as well as from T1 to T3 (T1mean = 1.78, SD = 0.12 to T3mean = 2.01, SD = 0.17, p < .0001), with no significant change between T2 and T3: p = 1.00). These results are displayed in Fig. 3.

Mean data and post-hoc analyses results for positive characteristics of outgroup, negative characteristics of outgroup, negative outgroup stereotyping, negative behavioral expectations, and willingness for social contact with outgroup are presented in Tables 4-8. All analyses showed a similar significant pattern of results, with the exception of the negative characteristics measure that reached a marginal level of significance after applying the step-down Bonferroni method, correcting for multiple comparisons. Results are graphically displayed for negative stereotyping of outgroup in Fig. 4 and for willingness for social contact with outgroup members in Fig. 5.

Notably, for all six significant dependent variables, partial η^2 values ranged from 0.05 to 0.26. In addition, based on Cohen's (1988) standards, the R^2 values for five of the dependent variables were above the

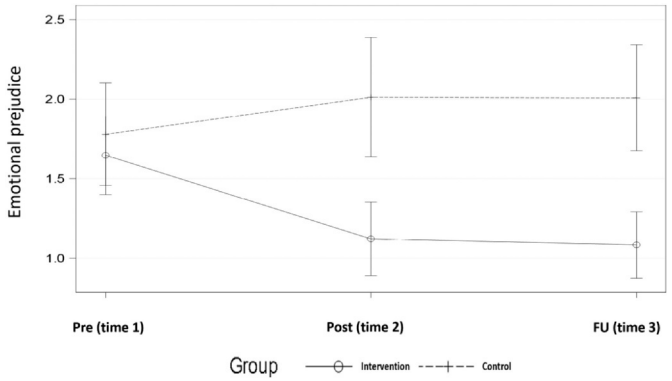

Fig. 3. Estimated mean values for emotional prejudice toward outgroup measured at T1 (pre-intervention), T2 (post-intervention), and at T3 (6 months follow up), comparing intervention group to control group. Error bars represent SD.

Table 4
(a) Means and SDs for T1 (pre intervention), T2 (post intervention), T3 (6 months follow up); and (b) post hoc comparisons for positive characteristics of outgroup across time points.

(a)

Measure	T1 (pre)	T2 (post)	T3 (follow up)
Positive characteristics of outgroup	M (SD)	M (SD)	M (SD)
Intervention	1.15 (0.15)	1.77 (0.22)	1.57 (0.15)
Control	1.00 (0.15)	0.59 (0.13)	0.61 (0.14)

(b)

	Comparison of Time A to Time B		Estimate	t value (df = 204)	p value (Stepdown Bonferroni correction)
	Time A	Time B			
Intervention	1	2	−0.43	−6.22***	< 0.0001
Intervention	1	3	−0.31	−4.28***	< 0.001
Intervention	2	3	0.12	1.88	1.0
Control	1	2	0.54	3.42*,**	0.02
Control	1	3	0.51	3.58*	0.01
Control	2	3	−0.03	−0.47	1.0

* p < .05.
** p < .01.
*** p < .001.

cutoff of 0.13, which is considered to be a medium effect size.

To thoroughly report results on all variables included in our survey, we also ran a multi-level modeling analysis on the negative ingroup stereotyping variable, although we did not expect a significant effect of the intervention. In line with expectations, none of the effects were significant, including the main effect for group ($F(1,204) = 0.16$, $p = .69$, partial $\eta^2 = 0.001$), the main effect for time ($F(2,204) = 2.57$, $p = .08$, partial $\eta^2 = 0.025$), and group X time interaction ($F(2,204) = 2.41$, $p = .09$, partial $\eta^2 = 0.023$), pseudo $R^2 = 0.004$. Means (and SDs) for intervention group were: T1 = 1.60 (0.12), T2 = 1.60 (0.09), and T3 = 1.59 (0.10). Means (and SDs) for control group were: T1 = 1.70 (0.08), T2 = 1.62 (0.06), and T3 = 1. 62 (0.06).

Finally, when we reran all analyses, this time including all covariates (gender, time spent playing Minecraft, enjoyment playing Minecraft, and strength of ethnic identity), we found the exact same pattern of results for all measures.

Table 5
(a) Means and SDs for T1 (pre intervention), T2 (post intervention), T3 (6 months follow up); and (b) post hoc comparisons for negative characteristics of outgroup across time points.*, **, ***

(a)

Measure	T1 (pre)	T2 (post)	T3 (follow up)
Negative characteristics of outgroup	M (SD)	M (SD)	M (SD)
Intervention	1.37 (0.20)	0.63 (0.19)	0.66 (0.18)
Control	1.37 (0.15)	1.65 (0.24)	1.63 (0.20)

(b)

	Comparison of Time A to Time B		Estimate	t value (df = 204)	p value (Stepdown Bonferroni correction)
	Time A	Time B			
Intervention	1	2	0.77	2.84	0.12
Intervention	1	3	0.73	2.88	0.11
Intervention	2	3	−0.04	−0.44	1.0
Control	1	2	−0.19	−1.25	1.0
Control	1	3	−0.18	−1.48	1.0
Control	2	3	0.01	0.23	1.0

* p < .05.
** p < .01.
*** p < .001.

Table 6
(a) Means and SDs for T1 (pre intervention), T2 (post intervention), T3 (6 months follow up); and (b) post hoc comparisons for negative outgroup stereotyping across time points.*, **

(a)

Measure	T1 (pre)	T2 (post)	T3 (follow up)
Negative outgroup stereotyping	M (SD)	M (SD)	M (SD)
Intervention	3.01 (0.11)	2.41 (0.15)	2.39 (0.15)
Control	3.09 (0.12)	3.18 (0.13)	3.17 (0.12)

(b)

	Comparison of Time A to Time B com		Estimate	t value (df = 204)	p value (Stepdown Bonferroni correction)
	Time A	Time B			
Intervention	1	2	0.59	7.20***	< 0.0001
Intervention	1	3	0.61	6.86***	< 0.0001
Intervention	2	3	0.02	0.73	1.0
Control	1	2	−0.10	−1.27	1.0
Control	1	3	−0.09	−1.2	1.0
Control	2	3	0.01	0.89	1.0

* p < .05.
** p < .01.
*** p < .001.

5. Discussion

The present research is the first to explore whether playing cooperative video games coupled with limited face-to-face contact can be used as an effective intervention to increase intergroup tolerance in the context of the intractable Israeli-Palestinian conflict. In a longitudinal experimental study, we found that over the course of six virtual sessions and two face-to-face meetings, 6th grade children who participated in

Table 7
(a) Means and SDs for T1 (pre intervention), T2 (post intervention), T3 (6 months follow up); and (b) post hoc comparisons for negative behavioral expectations across time points.*, **

(a)

Measure	T1 (pre)	T2 (post)	T3 (follow up)
Negative behavioral expectations	M (SD)	M (SD)	M (SD)
Intervention	3.19 (0.11)	2.69 (0.12)	2.67 (0.13)
control	3.31 (0.07)	3.43 (0.11)	3.38 (0.09)

(b)

	Comparison of Time A to Time B		Estimate	t value (df = 204)	p value (Stepdown Bonferroni correction)
	Time A	Time B			
Intervention	1	2	0.50	6.73***	< 0.0001
Intervention	1	3	0.52	5.99***	< 0.0001
Intervention	2	3	0.02	0.37	1.0
Control	1	2	−0.11	−1.28	1.0
Control	1	3	−0.06	−0.83	1.0
Control	2	3	0.04	2.25	0.59

* p < .05.
** p < .01.
*** p < .001.

Table 8
(a) Means and SDs for T1 (pre intervention), T2 (post intervention), T3 (6 months follow up); and (b) post hoc comparisons for willingness for social contact across time points.*, **

(a)

Measure	T1 (pre)	T2 (post)	T3 (follow up)
Willingness for social contact	M (SD)	M (SD)	M (SD)
Intervention	2.11 (0.11)	2.76 (0.12)	2.79 (0.11)
Control	1.99 (0.09)	1.83 (0.13)	1.82 (0.12)

(b)

	Comparison of Time A to Time B com		Estimate	t value (df = 204)	p value (Stepdown Bonferroni correction)
	Time A	Time B			
Intervention	1	2	−0.64	−8.11***	< 0.0001
Intervention	1	3	−0.68	−7.09***	< 0.0001
Intervention	2	3	−0.03	−1.2	1.0
Control	1	2	0.16	1.96	1.0
Control	1	3	0.18	2.27	0.59
Control	2	3	0.02	0.46	1.0

* p < .05.
** p < .01.
*** p < .001.

the "Play2Talk" program showed reduced intergroup bias on both cognitive and emotional indicators, including reduced stereotypical views, negative emotions and discriminatory tendencies toward members of the other ethnic group, as well as increased their willingness to have social contact with these members, compared to a control group, in which children played Minecraft and interacted with ingroup members. The intervention's effectiveness was consistent across measures, gender, and ethnic groups (Jewish-Israeli children and Palestinian-Israeli children).

Critically, the obtained effects of the "Play2Talk" program were preserved six months after termination of the program. The long-standing and robust effect of the program in decreasing both cognitive and emotional indicators of intergroup bias after six months should not be under-estimated, given that through the "ethos of conflict" (Lavi, Canetti, Sharvit, Bar-Tal, & Hobfoll, 2014, p. 68), prolonged ethnic and violent conflict is known to promulgate fear and hatred, resulting in naturally powerful forces to maintain negative views of outgroup members.

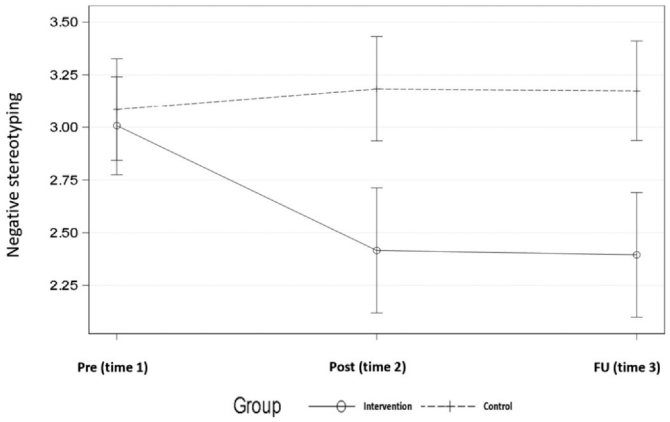

Fig. 4. Estimated mean values for negative stereotyping of outgroup measured at T1 (pre-intervention), T2 (post-intervention), and at T3 (6 months follow up), comparing intervention group to control group. Error bars represent SD.

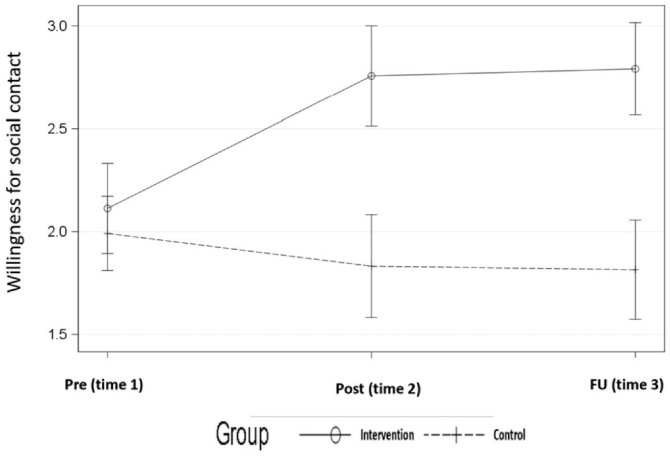

Fig. 5. Estimated mean values for willingness for social contact with outgroup members measured at T1 (pre-intervention), T2 (post-intervention), and at T3 (6 months follow up), comparing intervention group to control group. Error bars represent SD.

5.1. Contributions

The findings from the current research contribute to our knowledge of the effects of video gaming and intergroup contact in several ways. First, the current research extends the burgeoning literature on co-operative video games as tools for reducing intergroup bias (e.g., Adachi et al., 2015; Adachi et al., 2016; Stiff & Bowen, 2016; Vang & Fox, 2014; Velez et al., 2014) by being the first to document the effects of virtual-contact videogame interventions on attitudes toward members of ethnic or religious groups with whom significant levels of animosity exist. By focusing on the benefits of cooperative videogame play on intergroup tolerance in the extreme context of intractable conflicts, our findings expand on research demonstrating the potential pro-social effects of video gaming in general (Greitemeyer & Mugge, 2014). Critically, from a practical perspective, our findings suggest a convenient

intervention for children who live in conflict zones in which contact with members of adversarial outgroups is often limited. Finding useful tolerance-enhancing interventions within these contexts is especially important considering that lack of contact can serve as a strong force to ossify or escalate negative attitudes by excluding opportunities to become exposed to stereotype-inconsistent information (Bar-Tal & Teichman, 2005; Bigler & Liben, 2006). As such, virtual contact through cooperative video game play forms a viable and easy solution to implement, especially considering that electronic games are a dominant medium of entertainment for children and adolescents, with the majority playing on a regular weekly basis (Lenhart et al., 2008; Przybylski, 2014). Indeed, unlike most school-based interventions that require expensive designs such as forming dialogical groups, integrated schooling, cooperative learning and bilingualism (e.g., Beelmann & Heinemann, 2014; Berger, Gelkopf, et al., 2016), we offer an inexpensive but effective alternative that is even feasible for children who live in conflict zones.

Second, this study is also the first to examine the effects of this kind of intervention on children, which is critical considering that children's attitudes are more malleable than adults' (Aboud et al., 2012). Indeed, researchers suggest this might be because novel biases are easier to reverse before they have been extensively reinforced through life experiences (Devine, 1989; Greenwald & Banaji, 1995; Rudman, 2004). Moreover, elementary-school aged children's attitudes are more malleable than those of younger children because cognitive flexibility increases with age (Aboud, 2005; Aboud & Amato, 2001; Bigler & Liben, 2006; González et al., 2017) and this mechanism has been shown to reduce prejudice (Roets, Kruglanski, Kossowska, Pierro, & Hong, 2015; Tadmor et al., 2012; Tadmor et al., 2017). Thus, taking steps to develop a long-lasting intervention that could turn children more socially tolerant offers hope that they could grow up to be more socially tolerant adults. In turn, research has shown that more tolerant adults produce more tolerant children, creating a potential cycle of tolerance (Degner & Dalege, 2013; Miklikowska, 2016; Tadmor et al., 2017). Interestingly, our intervention was successful in reducing prejudice among Palestinian-Israeli children and not just among Jewish-Israeli children, which is a unique finding considering that virtually no studies have assessed the impact of interventions on changing attitudes of social minority children (Raabe & Beelmann, 2011).

Third, this research provides a first longitudinal investigation of the intervention. This is noteworthy considering that not only are long-term tests of interventions generally rare, but also they have yet to be studied within the context of video gaming (Adachi et al., 2016; Adachi & Willoughby, 2017; Beelmann & Heinemann, 2014). Indeed, most social tolerance interventions and certainly those that have looked at virtual cooperative gaming have been one-shot experiments, leaving researchers and practitioners without sufficient data to conclude whether the program is worth investing in. By conducting a longitudinal investigation, we were able to highlight the long-term success of the program. In fact, consistent with other work (e.g., Berger, Gelkopf, et al., 2016), the program was so successful that it managed to retain our experimental participants' high levels of social tolerance despite that fact that during the program period, a highly publicized intergroup murder occurred in the town in which we conducted the intervention, raising intergroup tensions between Palestinians and Israeli in this area. This is in stark contrast to results found among children in the control condition, where intergroup attitudes generally worsened during the intervention period (all ps' range from 0.016 to 0.035, with the exception of $p = .097$ for negative outgroup characteristics and $p = .151$ for negative stereotyping). Thus, even despite the negative social atmosphere following the murder, children who underwent the intervention program were able to sustain the significant reduction in prejudice, suggesting that the intervention may serve as a potent protective factor. This finding of longitudinal effectiveness is perhaps particularly important in the context of protracted violent conflicts like the Israeli-Palestinian one, where cycles of violence are rather typical. Finding a social tolerance intervention that can withstand even in the face of ongoing violence is especially critical.

Finally, we contribute to the discussion surrounding the potential differential effects of contact interventions on cognitive and emotional indictors of intergroup bias by designing our program to complement computer-mediated contact with some experience of face-to-face contact, thereby allowing for an optimal effect on both components of social tolerance. We suggest that although the prejudice reduction literature has sometimes dichotomized contact-based interventions into direct and indirect contact contexts (Dovidio et al., 2002; Millar & Tesser, 1986), it may be beneficial to conceptualize them as placed along a continuum from direct to indirect. At the most direct extreme of the continuum are face-to-face meetings that provide the richest communication context, involving physical cues, emotional cues, vocal cues, nonverbal cues, as well as the actual information conveyed by the participants. Research on this kind of face-to-face contact has shown repeatedly that it is successfully reduces only affective indicators of prejudice, such as negative emotions (e.g., Dovidio et al., 1996; Dovidio et al., 2002; Dovidio & Gaertner, 1993; Esses & Dovidio, 2002; Pettigrew & Tropp, 2000; Tropp & Pettigrew, 2005a, 2005b). In contrast, on the indirect extreme is asynchronous computer-mediated communication, in which emotional information is relatively scarce and all information is conveyed through writing, requiring cognitive analysis (Walther, 1996). This kind of focus expands the definition of contact to include non-interpersonal contact experiences that can also successfully reduce cognitive indicators such as stereotypes (e.g., Dovidio et al., 2002; Millar & Tesser, 1986; Paolini et al., 2007; Stangor, Sullivan, & Ford, 1991; Tadmor et al., 2012; Wright et al., 1997).

Moving forward, it may be worthwhile for researchers to delineate where on the continuum they consider their intervention to fall, and through that, make more specific predictions regarding whether they foresee effects on only emotional indicators of prejudice (as in the case of direct contact; Tropp & Pettigrew, 2005a), only on cognitive indicators of prejudice, or both. In our case, our hybrid form of intervention was able to impact both affective and cognitive social intolerance indicators. Impacting both is critical because it speaks to the completeness of the intervention, leaving no prejudiced stone left unturned. Indeed, affective indicators and cognitive indicators of prejudice jointly determine behavioral intentions and discriminatory behavior, such as discriminatory hiring decisions (Pettigrew, 1997, 2008; Pettigrew & Tropp, 2008; Tropp & Pettigrew, 2005a, 2005b; see also Brigham, 1993; Dovidio et al., 2002; Tadmor et al., 2012; Van Laar, Levin, Sinclair, & Sidanius, 2005). Without this joint effect, the ability to truly eradicate social intolerance is less likely.

5.2. Limitations and directions for future research

Though very promising, the study's findings should be considered with caution and interpreted in light of the following limitations. First, although within the schools, participants were randomly assigned to experimental conditions, the schools selected were not random. Therefore, the schools that agreed to take part in the study and implement the program may not be representative of the entire Israeli-Jewish/Palestinian population, respectively. It is encouraging that other child-focused interventions in Israel have also successfully reduced intergroup bias between Jews and Palestinians (e.g., Berger et al., 2015; Berger, Gelkopf, et al., 2016), but future research would benefit from testing the intervention in other contexts both within Israel and beyond. Second, the current study's sample was relatively small, including only 89 students. Though our sample size significantly surpasses what we used as a benchmark to meet necessary power requirements (Adachi et al., 2016), future studies would benefit from larger samples.

Third, the intervention failed to induce an increase in actual contact between groups. Partially, this might have been due to our reliance on a single item measure and a relatively short follow-up period of only six

months, which may have been ill-equipped to capture subtler changes in contact behavior. In this regard, it is noteworthy that children who underwent the intervention did consistently demonstrate an increased willingness for contact with the outgroup. Nonetheless, given that at this age group, parents are the ones who control their children's interaction activities, effects on actual contact may take longer to materialize. Indeed, looking forward, perhaps interventions that involve a greater component of parental involvement would help promote greater change in reported behavior, especially considering the strong ties that exist between parent and child intergroup attitudes (Degner & Dalege, 2013; Tadmor et al., 2017). An additional promising avenue for future research would be to explore whether the degree of parental prejudice may act as a moderating factor of the intervention's efficacy. For example, research has shown that children of more multicultural mothers are less prejudiced, with this relationship mediated by reduced levels of Need for Cognitive Closure (NFCC; Tadmor et al., 2017). Could there be a floor effect for these children, who are already so socially tolerant, they cannot decline in this prejudice any further? In contrast, children whose parents are highly prejudiced may be more responsive to the intervention because they begin with already very high levels of intolerance. This suggestion dovetails with research findings showing that the reduction in prejudice resulting from intergroup contact was especially evident in high NFCC participants (Dhont, Roets, & van Hiel, 2011). Thus, it is possible that the positive experiences with virtual contact via cooperative gaming can reverse children's biases before they are extensively reinforced. Indeed, this is perhaps especially important in elementary-school aged children, when parents begin to lose their role as ultimate sources of epistemic authority (Miklikowska, 2016; Nastie, Diamond, & Bar-Tal, 2015; Raabe & Beelmann, 2011) and children become more open to other environmental sources of influence.

Fourth, although our research focus was on testing whether intergroup virtual contact via cooperative video gaming would improve social tolerance relative to intragroup virtual contact, future research should tease out the core of the effect—is it due to the virtual intergroup contact in itself, or to the cooperative aspect of the game? Intergroup contact researchers (e.g., Allport, 1954; Pettigrew, 1998) have always contended that one of the core elements of successful contact interventions is intergroup cooperation. Given the nascent nature of the research on virtual contact in general, we had made sure we met all preliminary conditions outlined in intergroup contact theory in the design of the study, including the element of cooperation, in order to cleanly compare intergroup vs. intragroup contact effects in virtual contexts. And yet, it would be fruitful for future research to add a contact condition that is not materialized by playing video games together. Perhaps we would find that cooperative video game outgroup contact is an even more powerful prejudice reduction tool than other forms of outgroup contact. Another design issue that would benefit from addition empirical attention is that by employing an intervention that included mainly virtual contact but also some elements of direct contact, we are unable to isolate the size of the effect related to each component. Although the main focus on the program was on the virtual gaming, future research should compare interventions that have either one or both components for a finer-grained analysis of which emotional and cognitive indicators are impacted the most.

Fifth, our measures were based on self-report and included neither behavioral nor implicit measures of intergroup bias. Although this limitation is common in intervention research (Beelmann & Heinemann, 2014), verifying implications on these kinds of measures is important. Finally, we did not explore the potential mechanisms underlying the program's effectiveness. One potential candidate worth investigating is that of recategorization. Indeed, Adachi et al. (2016) provided empirical support for the role of recategorization, whereby cooperative virtual game playing led participants to feel psychologically on the same team and connected with the outgroup member, consequently increasing tolerance toward the outgroup. Future research should also investigate the potential role of Need for Cognitive Closure (NFCC; Kruglanski & Webster, 1996) as a potential driver of the link between cooperative video playing and increased social tolerance. Indeed, previous research has consistently linked experiences of indirect contact to reductions in NFCC, and consequently, to greater levels of social tolerance (e.g., Tadmor et al., 2012; Tadmor et al., 2017; Tadmor et al., 2018). In the current context, it is possible that when exposed to outgroup members via cooperative virtual contact, participants may call into question existing assumptions about outgroup members and increase their motivation to entertain alternative hypotheses about them, thereby viewing them in less prejudiced ways.

5.3. Conclusion

Despite the aforementioned limitations, the results of the current longitudinal investigation provide strong support for the efficacy of the “Play2Talk” program in creating a long-lasting reduction in intergroup bias among Jewish-Israeli and Palestinian-Israeli elementary-school students. These kinds of cooperative computer-mediated video gaming interventions are especially important for children living in areas affected by violent and highly hostile ethnic conflicts. Children living is such regions have very limited opportunities for direct positive contact with outgroup members, and they are consistently exposed to their societies' general negative outgroup attitudes. Thus, providing children in these hardship zones with an opportunity to reduce intergroup bias from the comfort of their computer is not only priceless but required to help avoid further escalation. Hopefully, future research will build on our promising initial results to refine and improve these kinds of interventions.

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Declaration of Competing Interest

The authors declare no potential conflicts of interest.

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